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Lynch et al.

(10) **Patent No.: US 9,310,981 B2**
(45) **Date of Patent: Apr. 12, 2016**

(54) **SEAMLESS EDITING AND SAVING OF ONLINE CONTENT ITEMS USING APPLICATIONS**

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(73) Assignee: **Dropbox, Inc.**, San Francisco, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/105,059**

(22) Filed: **Dec. 12, 2013**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 61/764,392, filed on Feb. 13, 2013.

(51) **Int. Cl.**

G06F 3/048	(2013.01)
G06F 17/30	(2006.01)
G06F 17/24	(2006.01)
G06F 9/445	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC ***G06F 3/04842*** (2013.01); ***G06F 9/44505*** (2013.01); ***G06F 17/24*** (2013.01); ***G06F 17/30011*** (2013.01); ***G06F 17/30893*** (2013.01); *H04L 67/02* (2013.01)

(58) **Field of Classification Search**

CPC G06F 17/30165; G06F 21/31; G06F 9/44; G06F 17/3089; G06F 17/30575; G06F 17/24; H04L 67/1095; H04L 67/02; H04L 67/2814; H04L 67/2838; H04L 67/18

USPC 716/736

See application file for complete search history.

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(Continued)

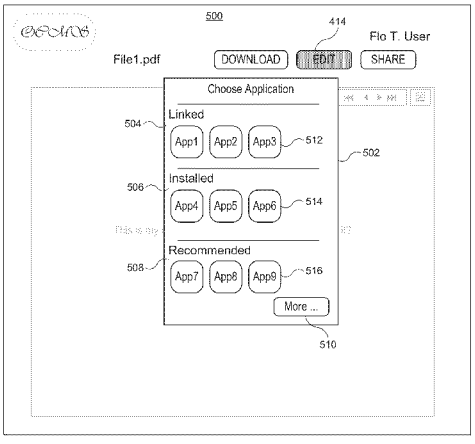
Primary Examiner — Amy M Levy

(74) *Attorney, Agent, or Firm* — Sheppard, Mullin, Richter & Hampton LLP

(57) **ABSTRACT**

A user viewing an online content item using an online content client application can, from within that application, launch an operating application to operate on the content item. The operating application can interact with the online content management provider to obtain a current copy of the content item and to save a modified content item back to the online content management service, e.g., if the user instructs the operating application to save the item. Interactions between the client application, the operating application and the online content management service can occur without requiring the user to manually initiate upload or download of any content items. Operations on an online content item can also be initiated from within an operating application.

11 Claims, 28 Drawing Sheets



(51) **Int. Cl.**
H04L 29/08 (2006.01)
G06F 3/0484 (2013.01)

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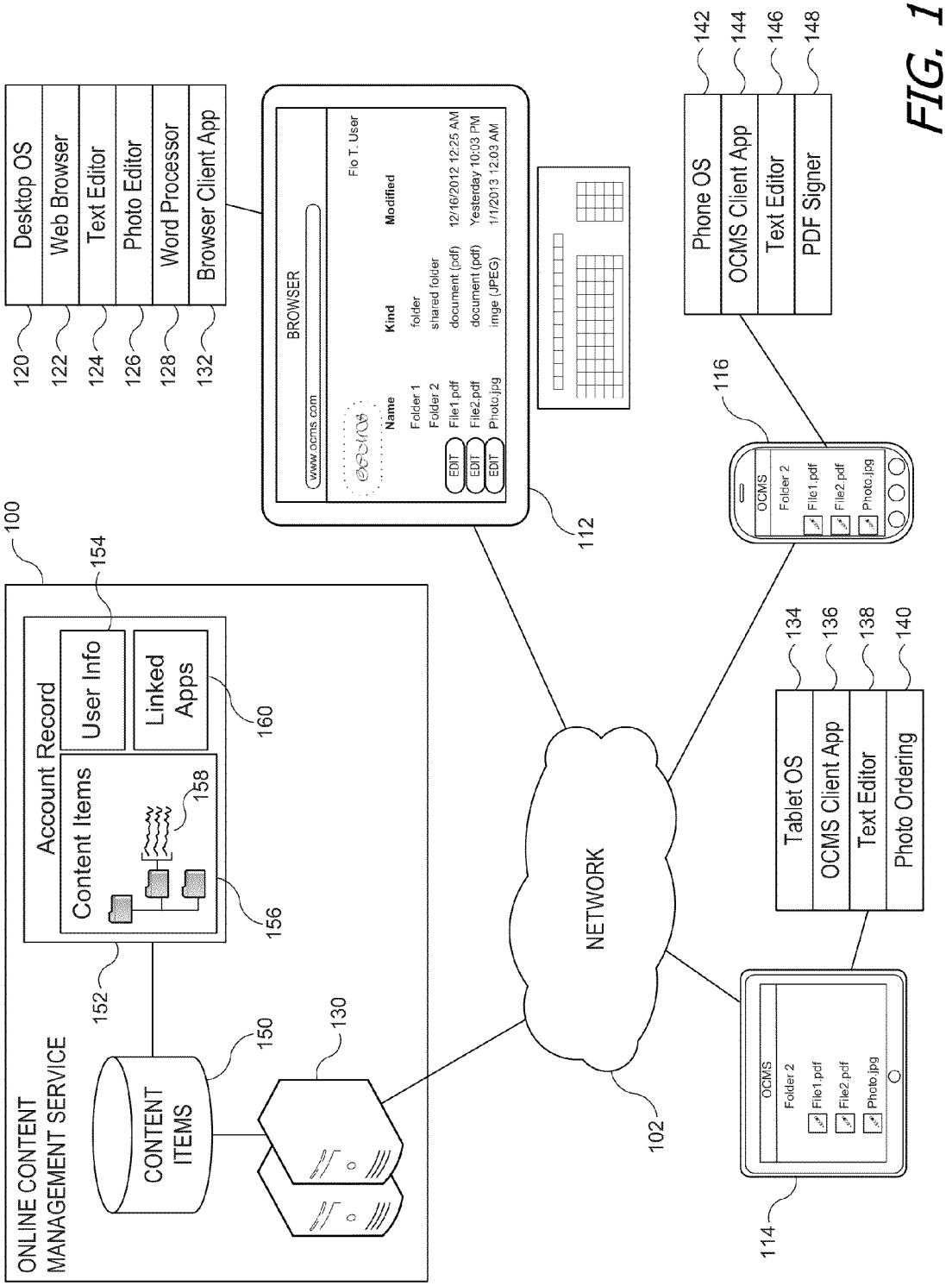
ONLINE CONTENT MANAGEMENT SERVICE
100
Account Record
154
User Info
Linked Apps
160
Content Items
158
156
152
CONTENT ITEMS
150
130
NETWORK
102
Desktop OS
Web Browser
Text Editor
Photo Editor
Word Processor
Browser Client App
120
122
124
126
128
132
BROWSER
www.ocms.com
Flo T. User
Name
Kind
Modified
Folder 1
folder
Folder 2
shared folder
File1.pdf
document (pdf)
12/16/2012 12:25 AM
File2.pdf
document (pdf)
Yesterday 10:03 PM
Photo.jpg
image (JPEG)
1/1/2013 12:03 AM
EDIT
112
Phone OS
OCMS Client App
Text Editor
PDF Signer
142
144
146
148
116
OCMS
Folder 2
File1.pdf
File2.pdf
Photo.jpg
Tablet OS
OCMS Client App
Text Editor
Photo Ordering
134
136
138
140
114

FIG. 1

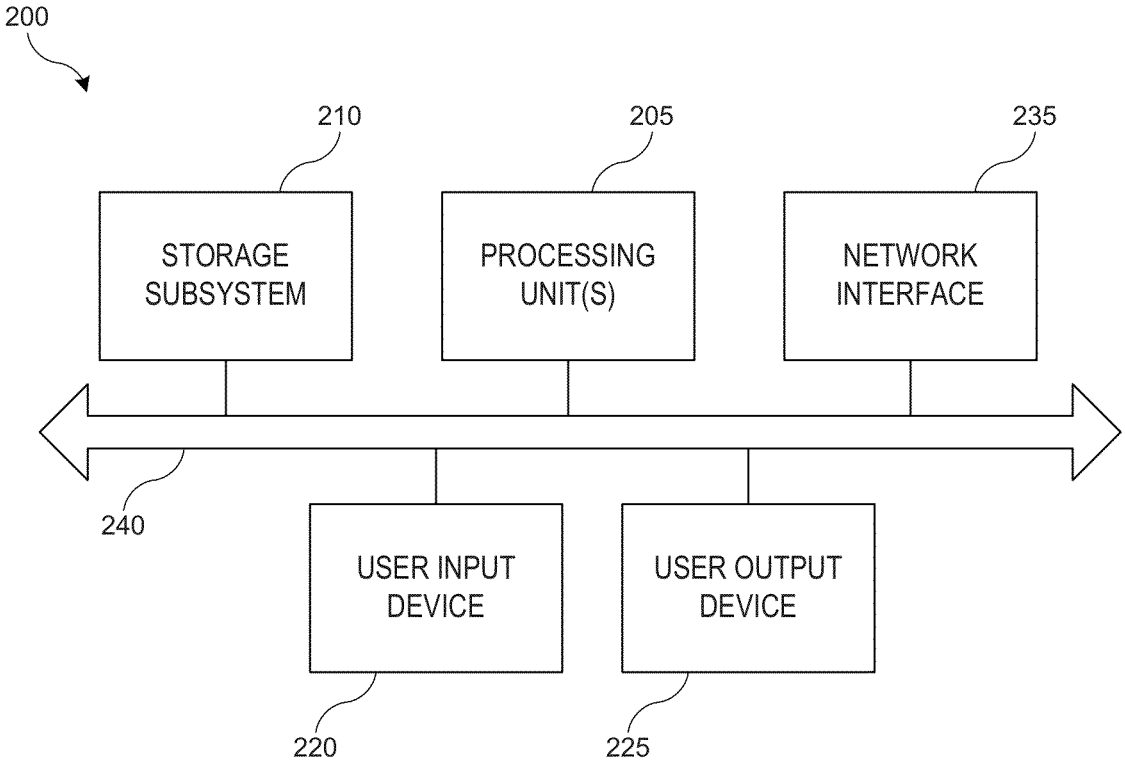
200
210
205
235
STORAGE SUBSYSTEM
PROCESSING UNIT(S)
NETWORK INTERFACE
240
USER INPUT DEVICE
USER OUTPUT DEVICE
220
225

FIG. 2

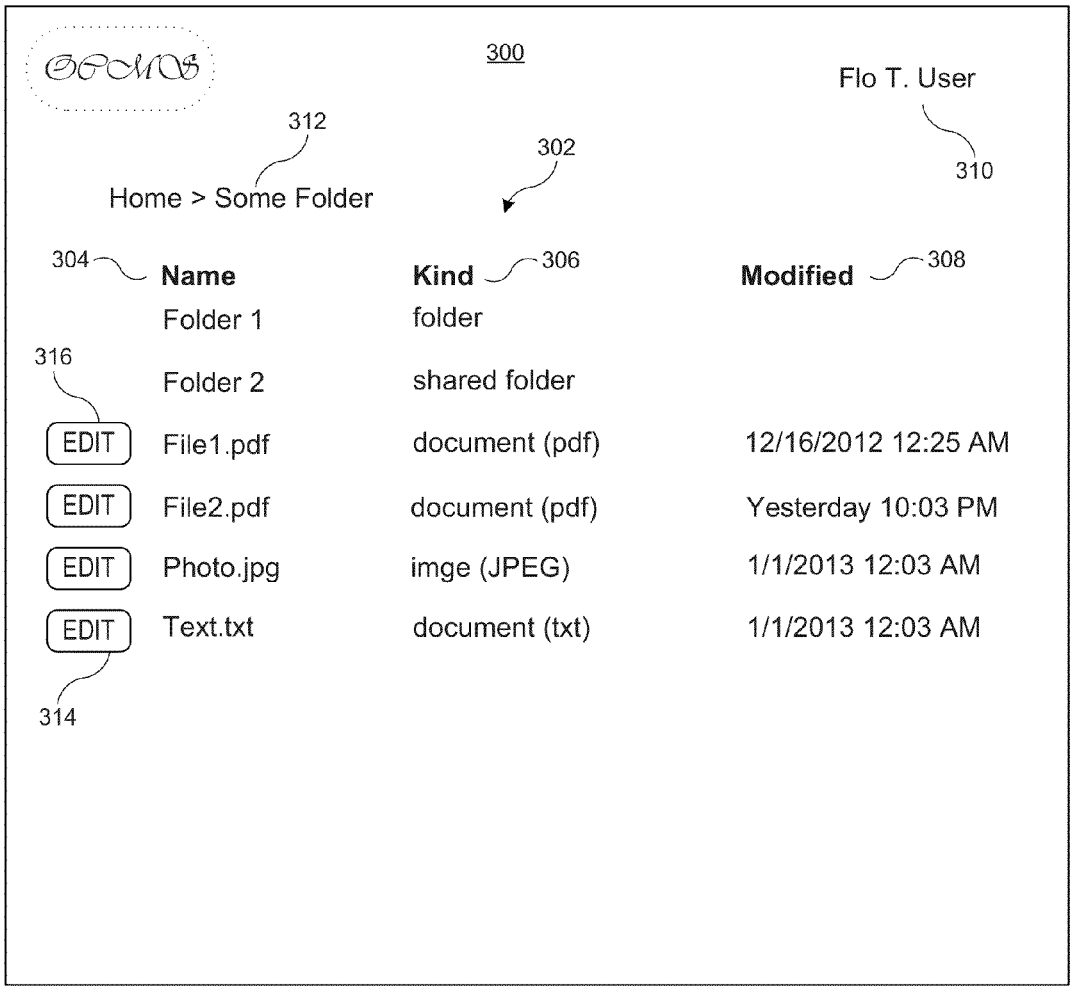
300
Flo T. User
310
312
Home > Some Folder
302
304
Name
Kind
306
Modified
308
Folder 1
folder
316
Folder 2
shared folder
EDIT
File1.pdf
document (pdf)
12/16/2012 12:25 AM
EDIT
File2.pdf
document (pdf)
Yesterday 10:03 PM
EDIT
Photo.jpg
imge (JPEG)
1/1/2013 12:03 AM
EDIT
Text.txt
document (txt)
1/1/2013 12:03 AM
314

FIG. 3

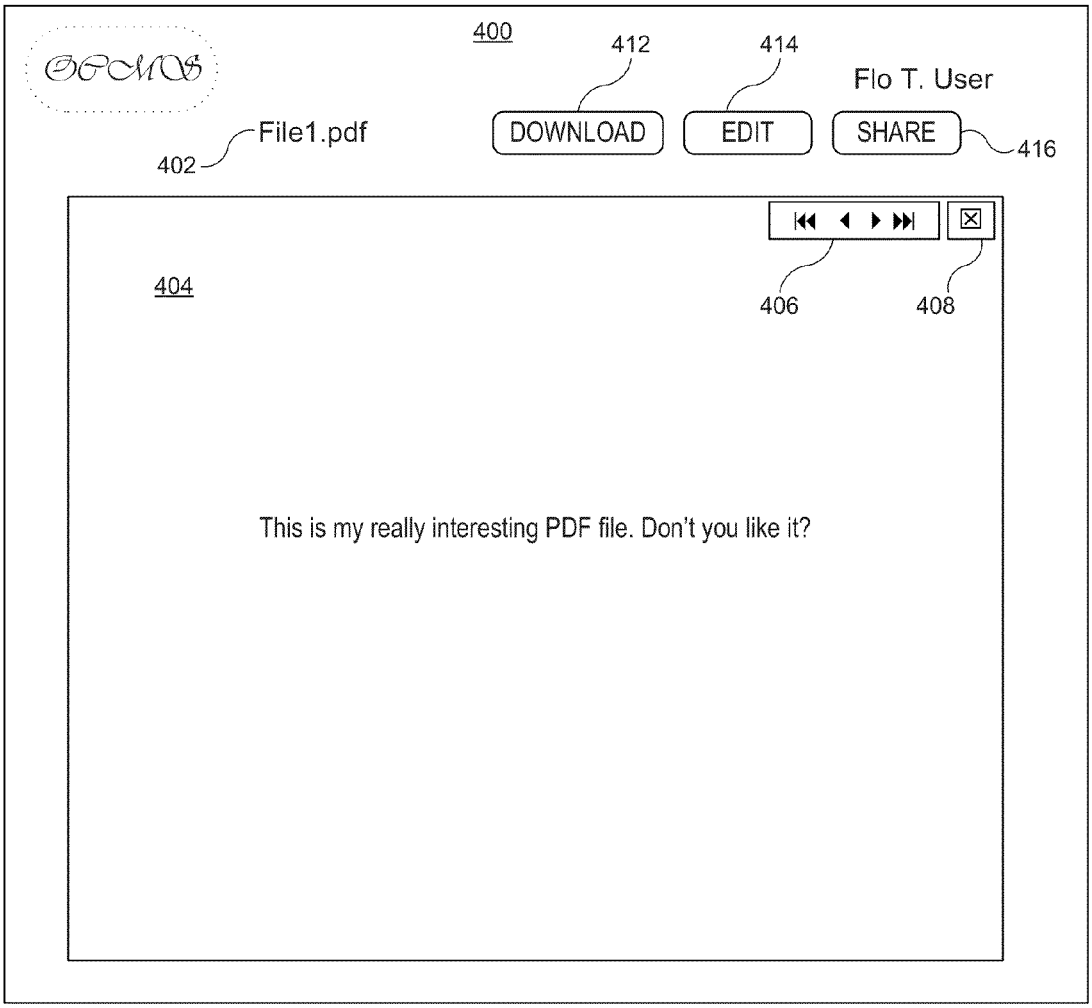
400
412
414
Flo T. User
DOWNLOAD
EDIT
SHARE
416
File1.pdf
402
404
406
408
This is my really interesting PDF file. Don't you like it?

FIG. 4

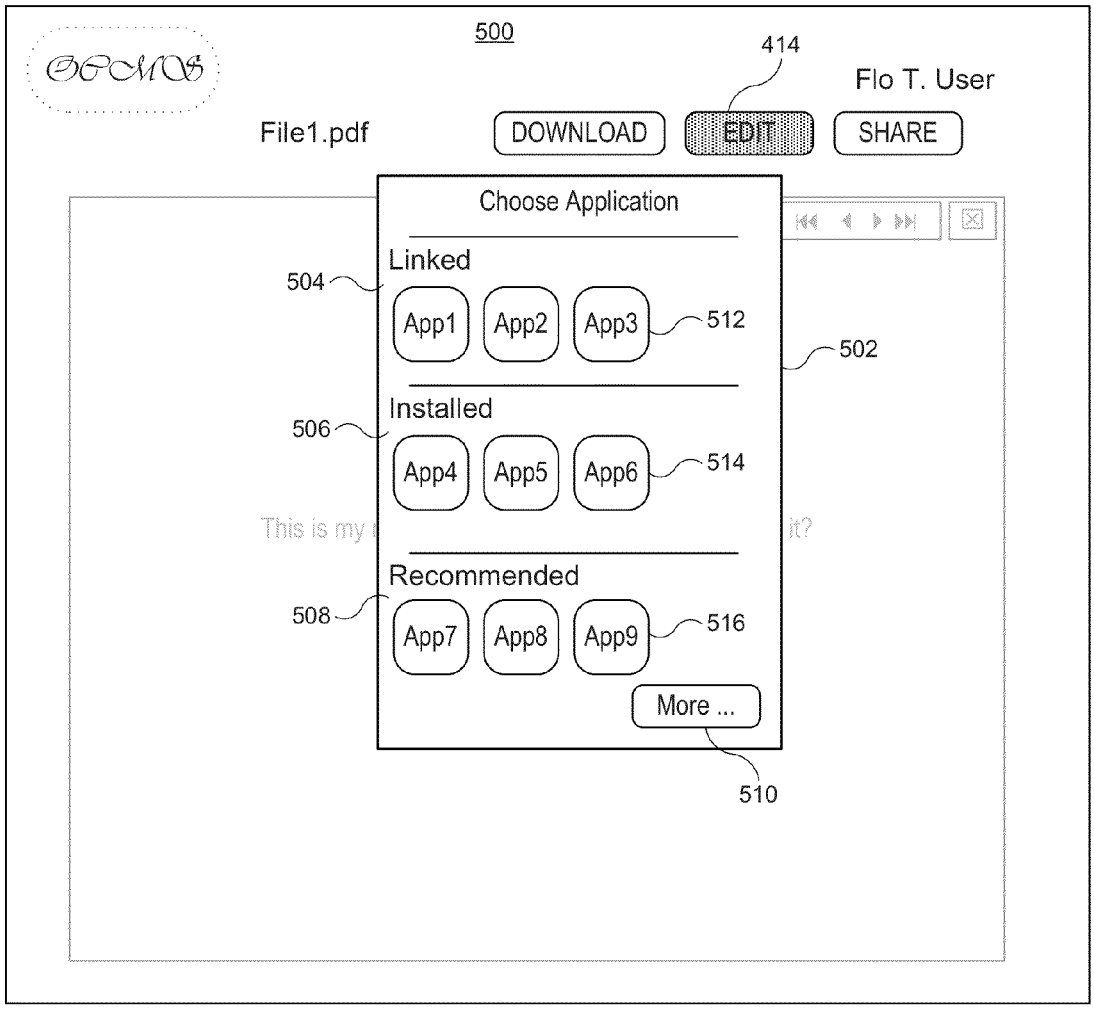
500
414
Flo T. User
File1.pdf
DOWNLOAD
EDIT
SHARE
Choose Application
Linked
504
App1
App2
App3
512
502
Installed
506
App4
App5
App6
514
Recommended
508
App7
App8
App9
516
More ...
510

FIG. 5

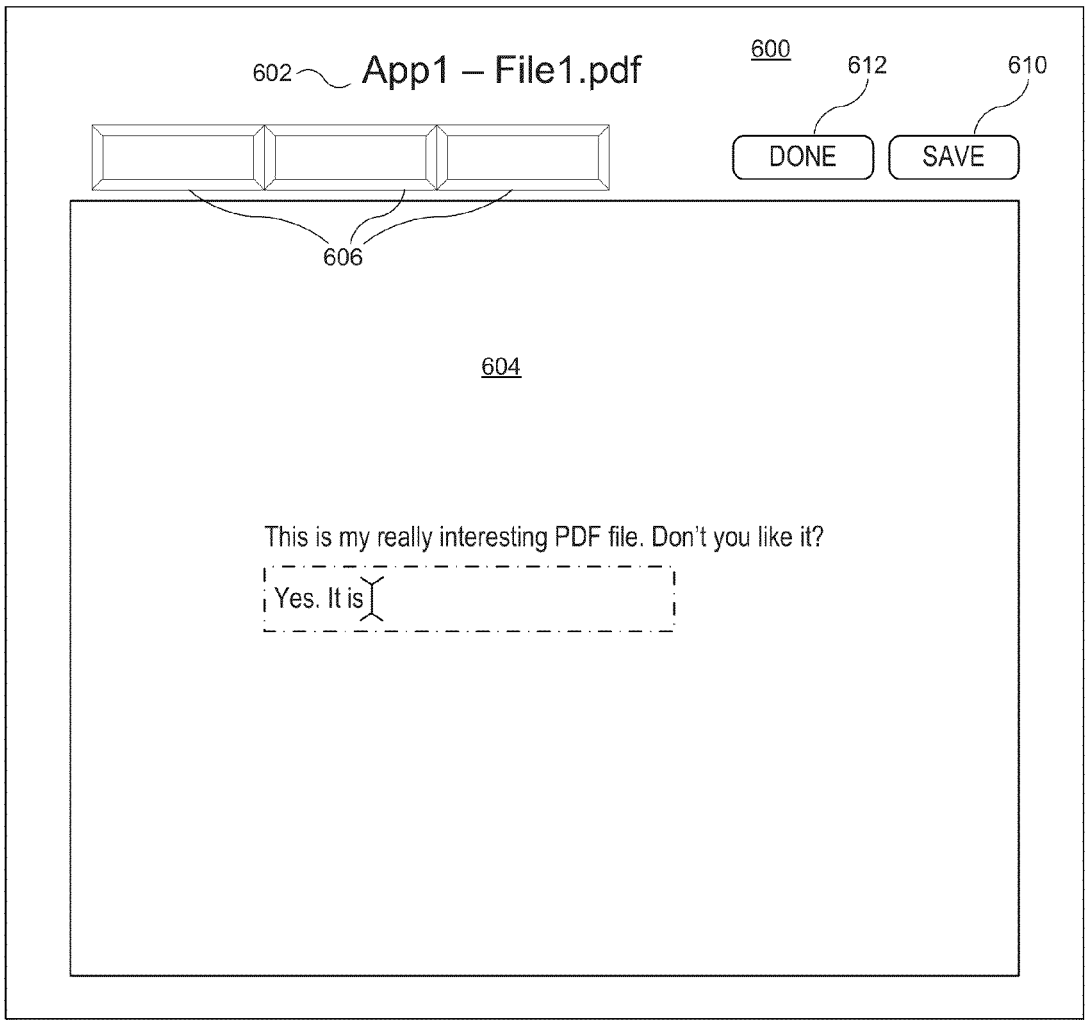
602
App1 – File1.pdf
600
612
610
DONE
SAVE
606
604
This is my really interesting PDF file. Don't you like it?
Yes. It is

FIG. 6A

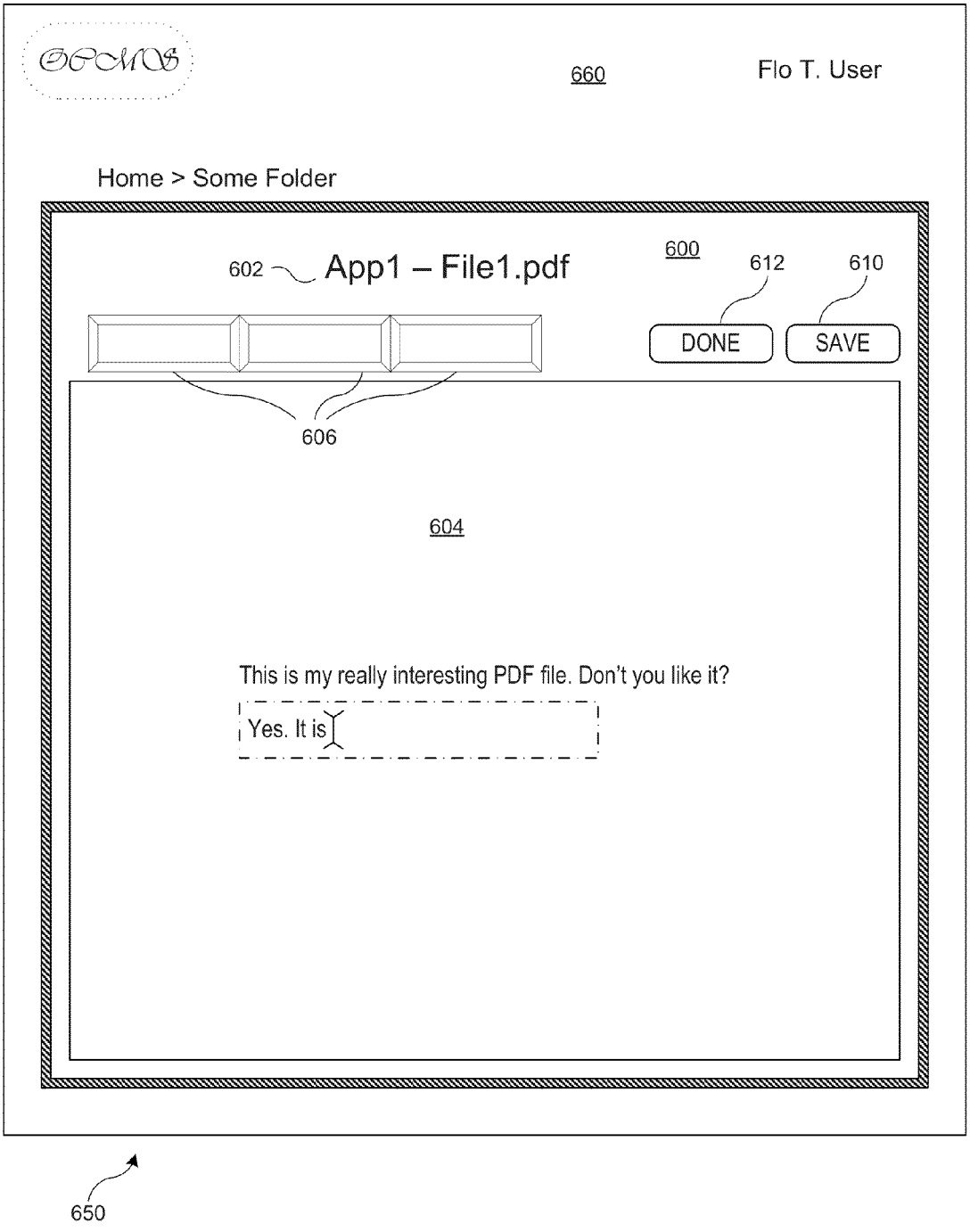
660
Flo T. User
Home > Some Folder
602
App1 – File1.pdf
600
612
610
DONE
SAVE
606
604
This is my really interesting PDF file. Don't you like it?
Yes. It is
650

FIG. 6B

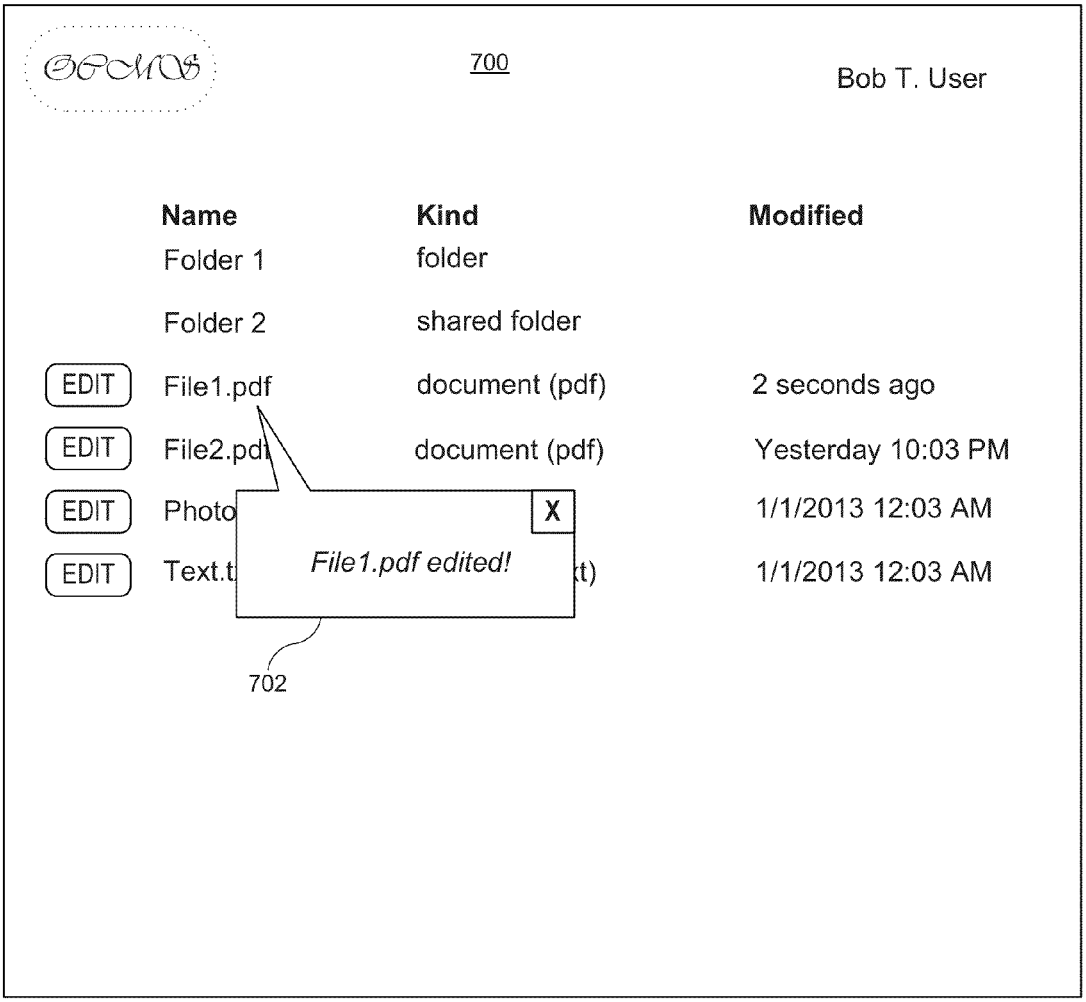
OCMS
700
Bob T. User
Name
Kind
Modified
Folder 1
folder
Folder 2
shared folder
EDIT
File1.pdf
document (pdf)
2 seconds ago
EDIT
File2.pdf
document (pdf)
Yesterday 10:03 PM
EDIT
Photo
1/1/2013 12:03 AM
EDIT
Text.t
t)
1/1/2013 12:03 AM
X
File1.pdf edited!
702

FIG. 7

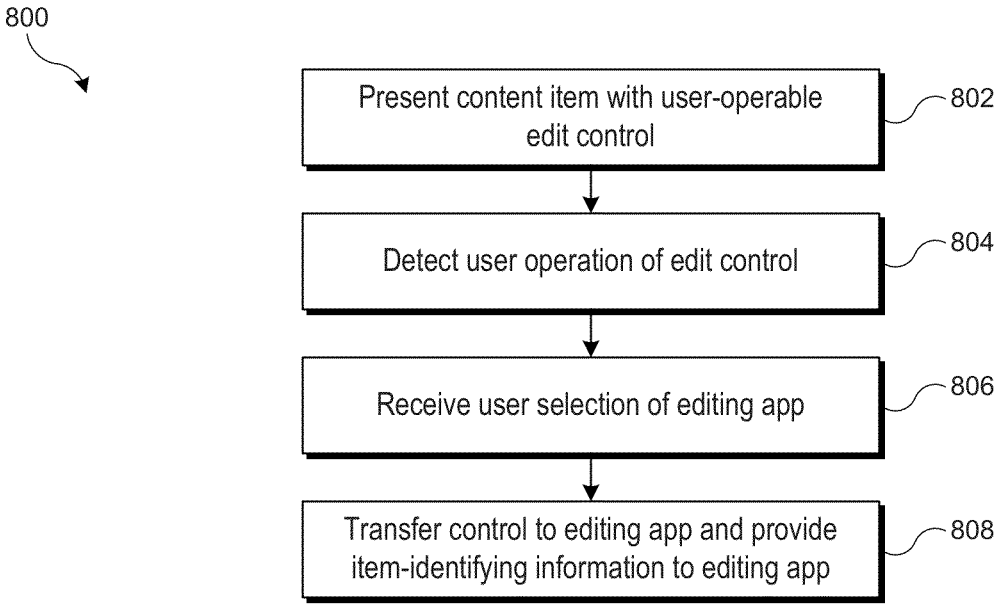
800
Present content item with user-operable edit control
802
Detect user operation of edit control
804
Receive user selection of editing app
806
Transfer control to editing app and provide item-identifying information to editing app
808

FIG. 8

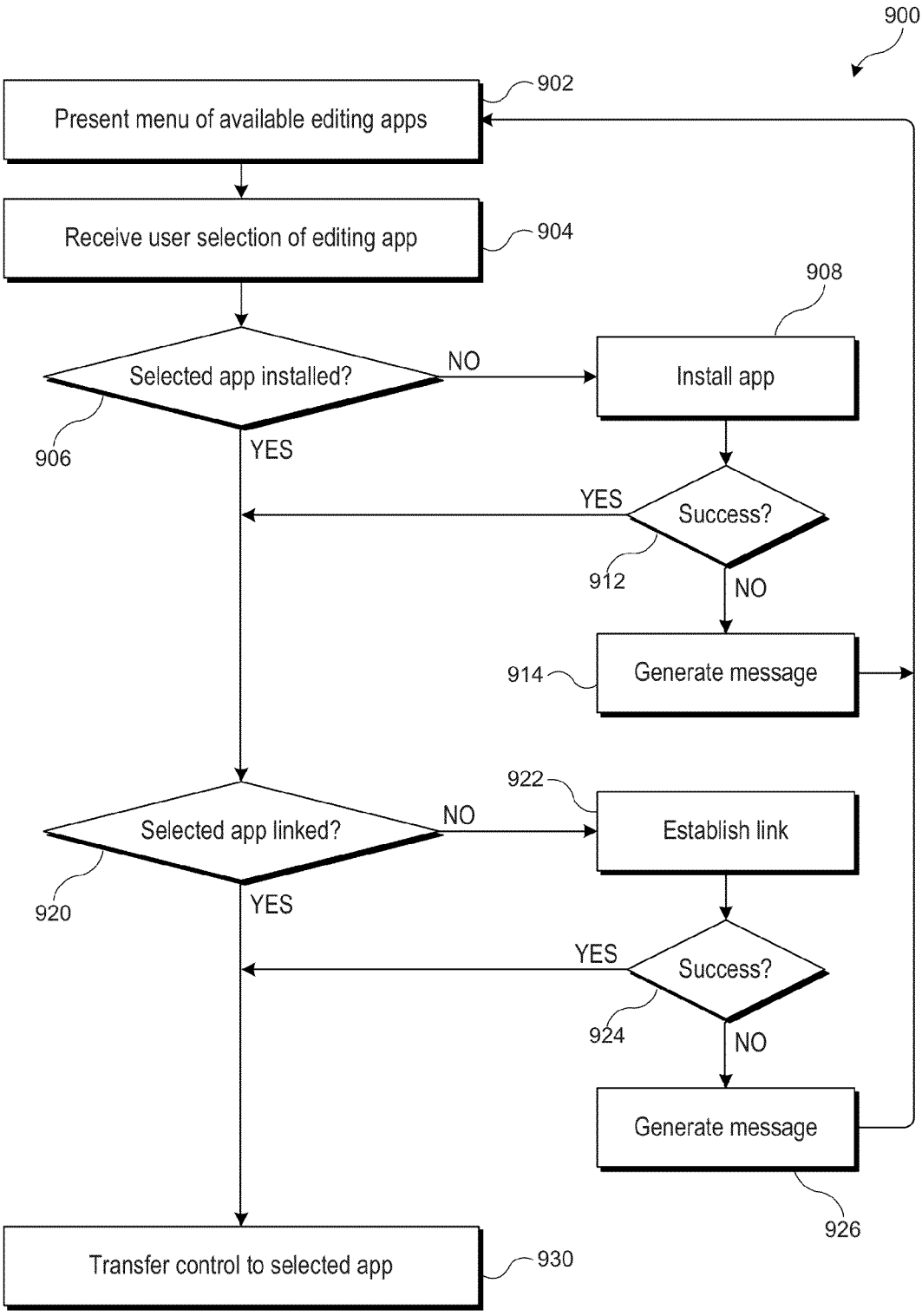
900
902
Present menu of available editing apps
Receive user selection of editing app
904
908
Selected app installed?
NO
Install app
906
YES
YES
Success?
912
NO
914
Generate message
922
Selected app linked?
NO
Establish link
920
YES
YES
Success?
924
NO
Generate message
926
Transfer control to selected app
930

FIG. 9

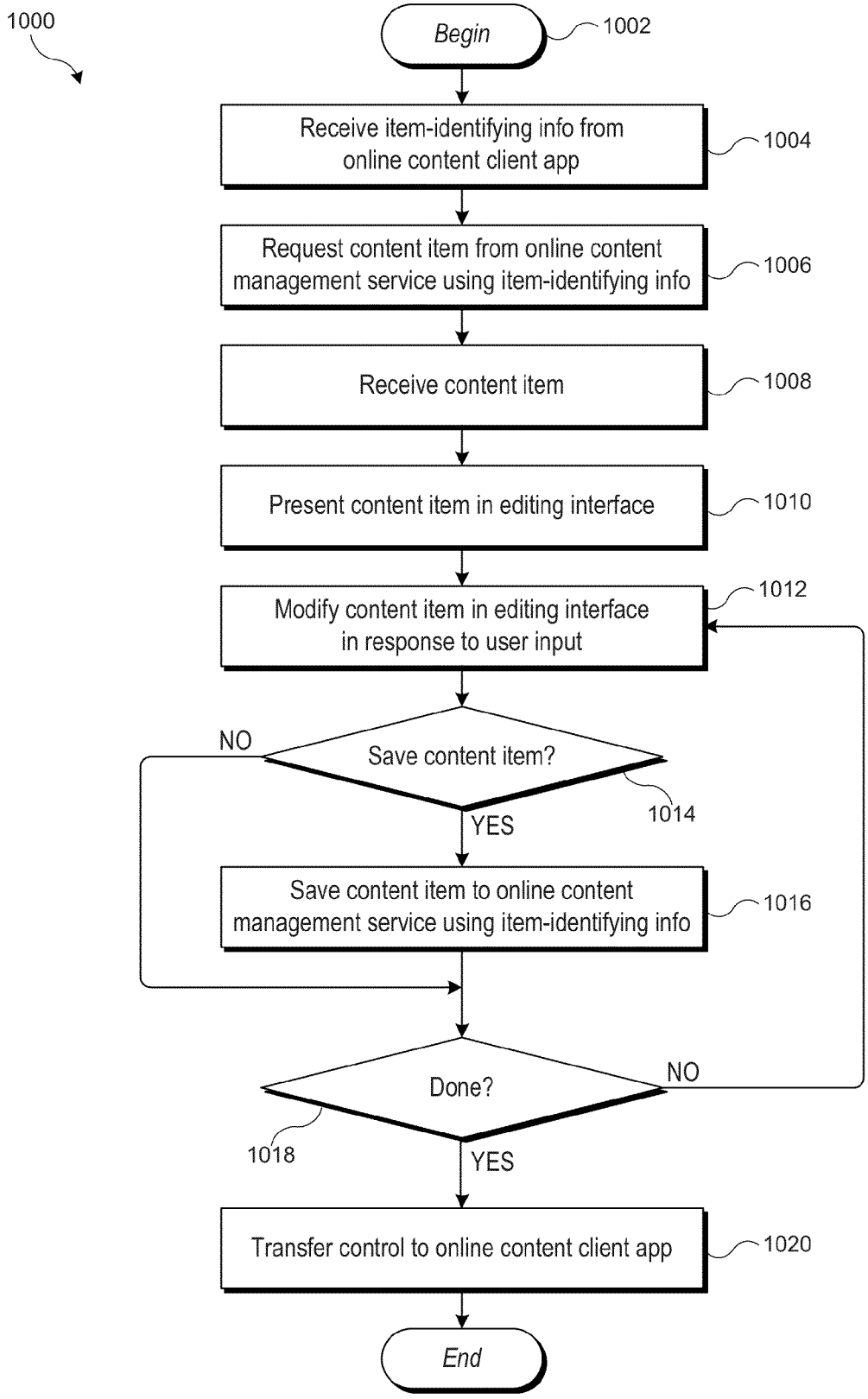
1000
Begin
1002
Receive item-identifying info from online content client app
1004
Request content item from online content management service using item-identifying info
1006
Receive content item
1008
Present content item in editing interface
1010
Modify content item in editing interface in response to user input
1012
Save content item?
NO
YES
1014
Save content item to online content management service using item-identifying info
1016
Done?
NO
YES
1018
Transfer control to online content client app
1020
End

FIG. 10

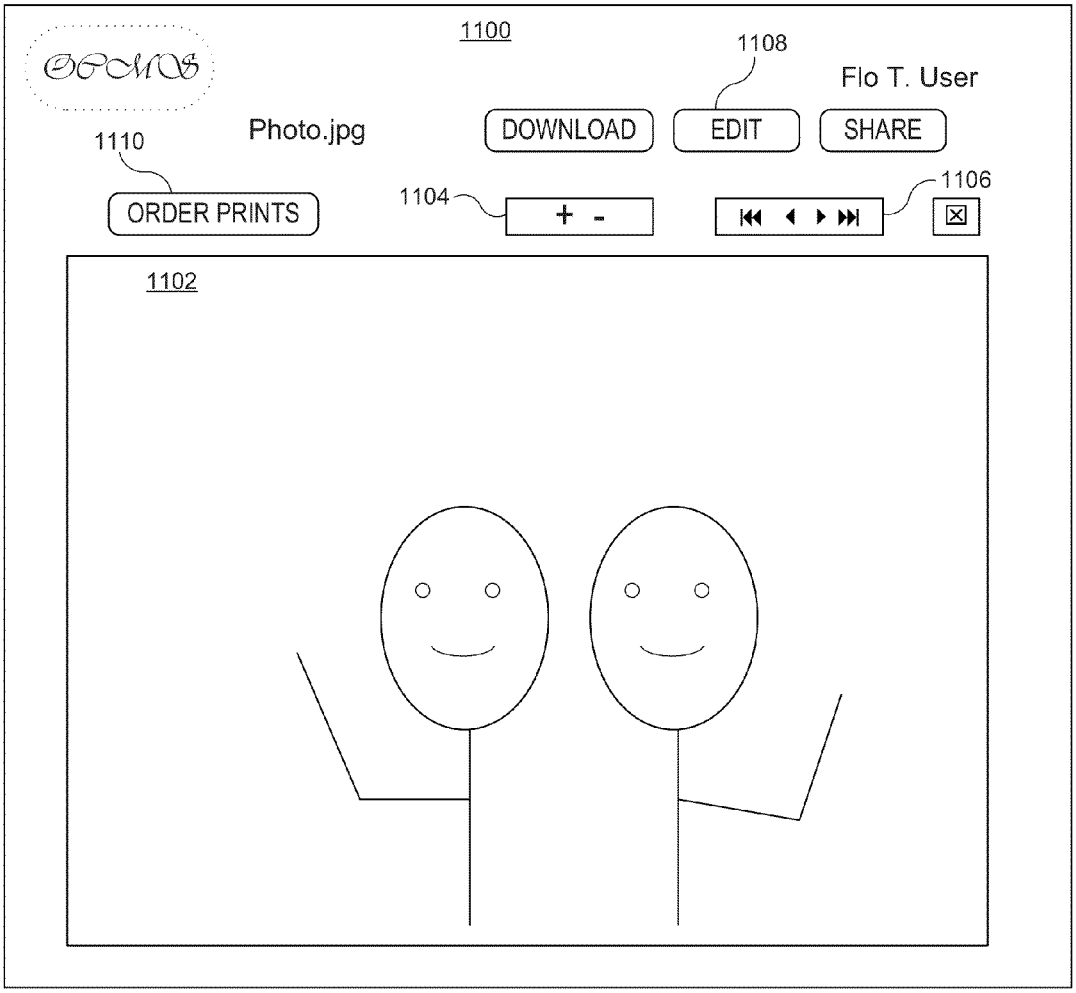
1100
1108
Flo T. User
Photo.jpg
DOWNLOAD
EDIT
SHARE
1110
ORDER PRINTS
1104
+ -
1106
1102

FIG. 11

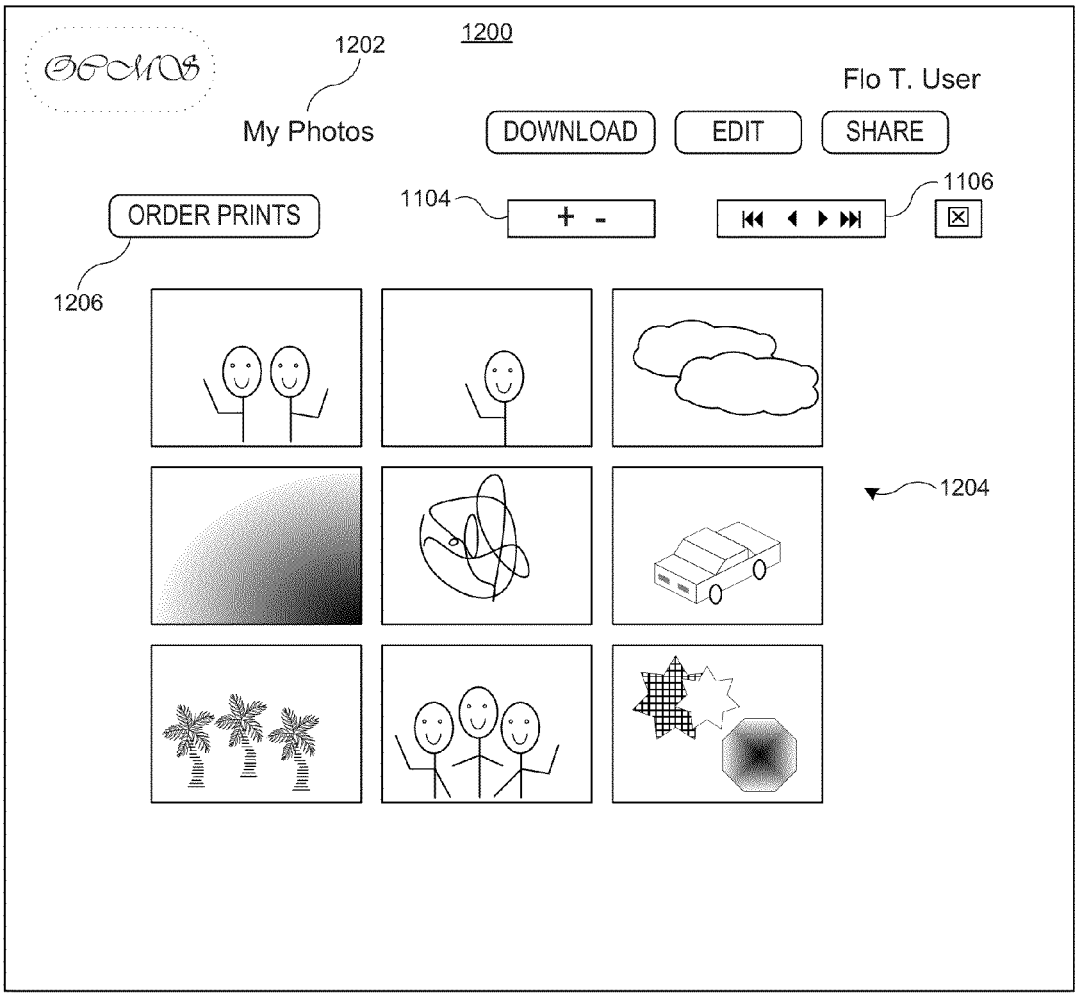
1200
1202
My Photos
Flo T. User
DOWNLOAD
EDIT
SHARE
ORDER PRINTS
1104
+ -
1106
1206
1204

FIG. 12

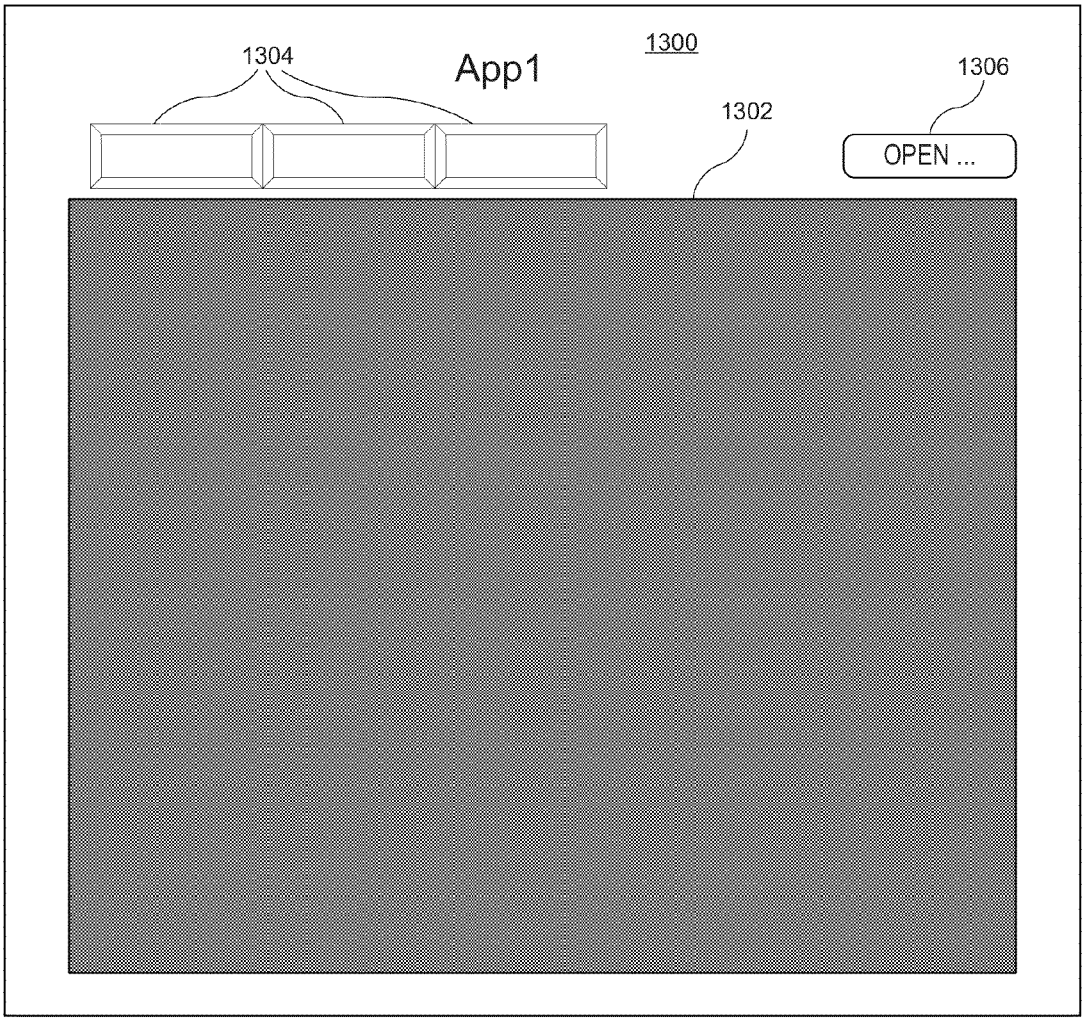

FIG. 13

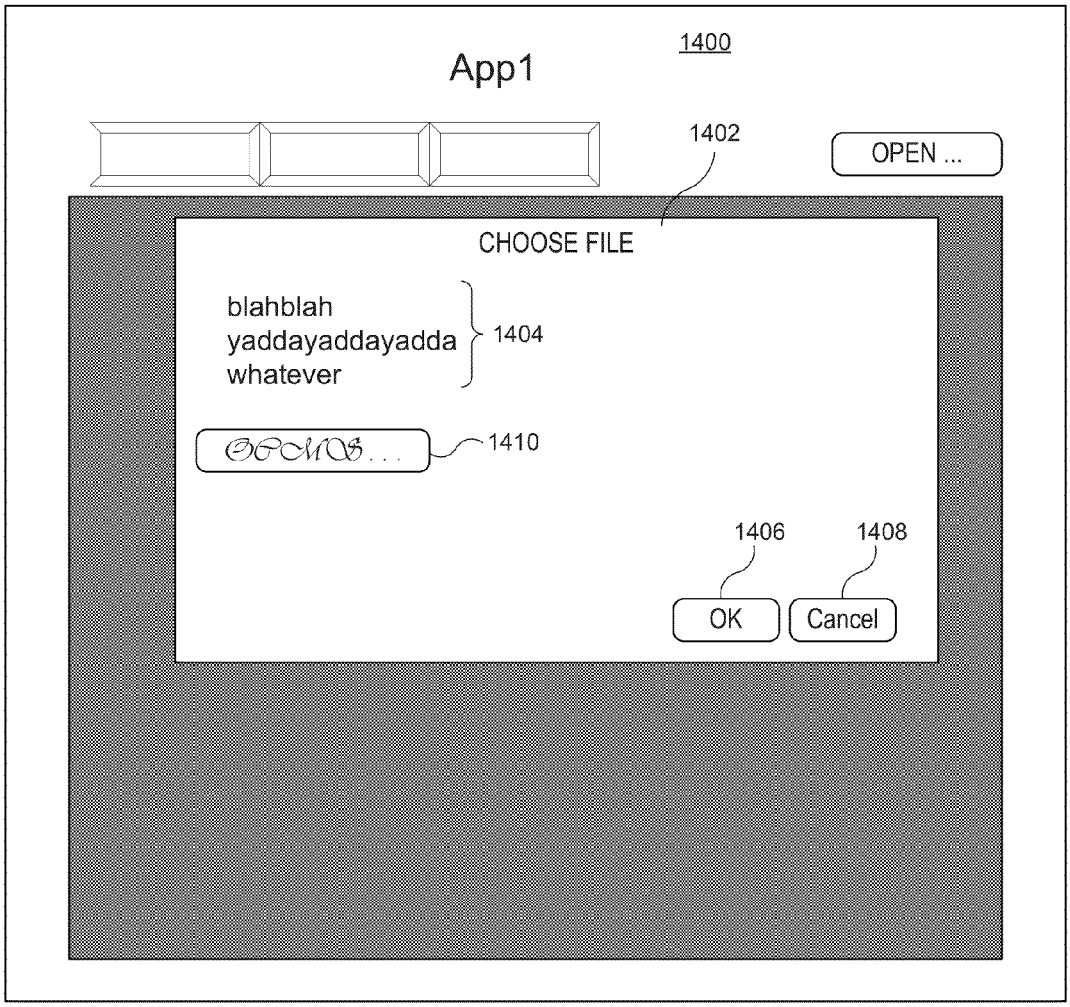
1400
App1
1402
OPEN ...
CHOOSE FILE
blahblah
yaddayaddayadda
whatever
1404
1410
1406
1408
OK
Cancel

FIG. 14

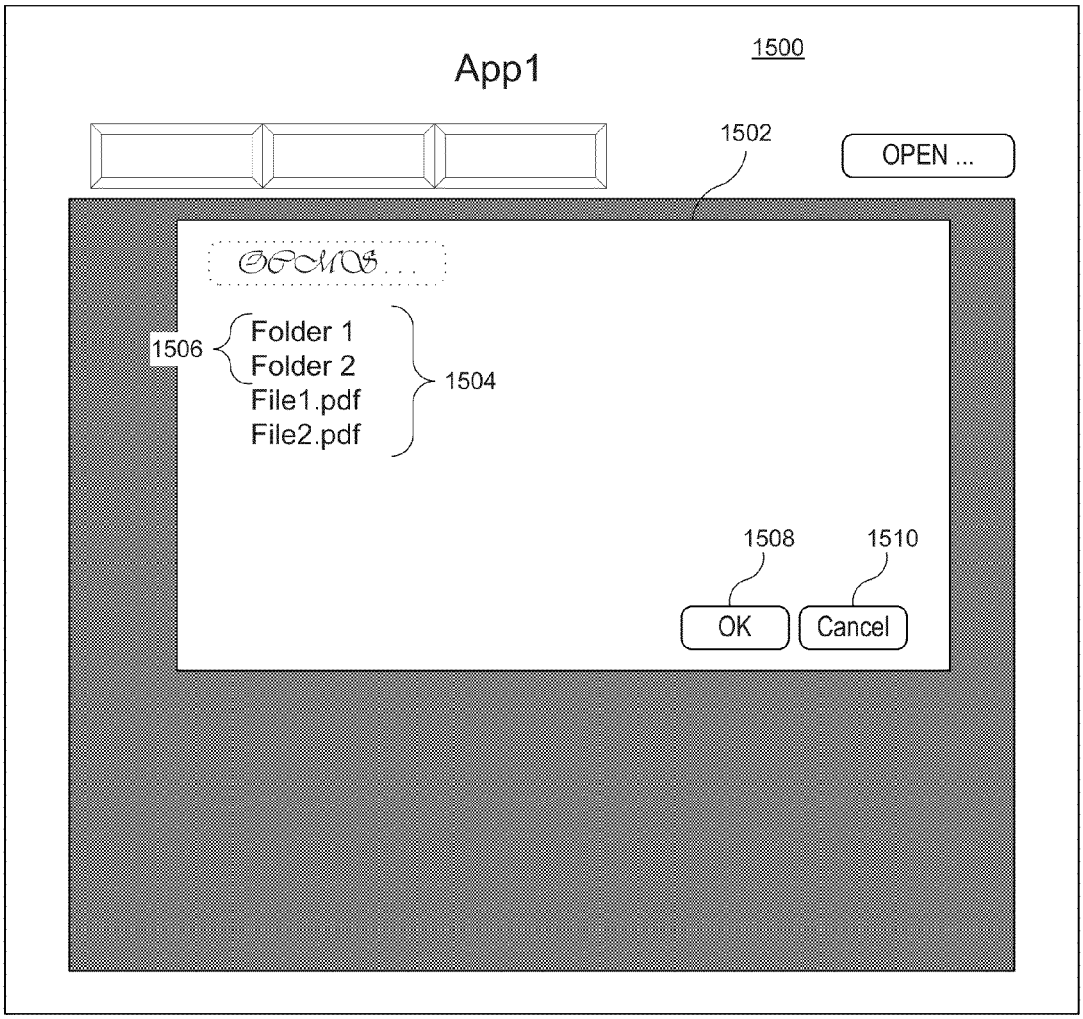
App1
1500
1502
OPEN ...
1506
Folder 1
Folder 2
File1.pdf
File2.pdf
1504
1508
1510
OK
Cancel

FIG. 15

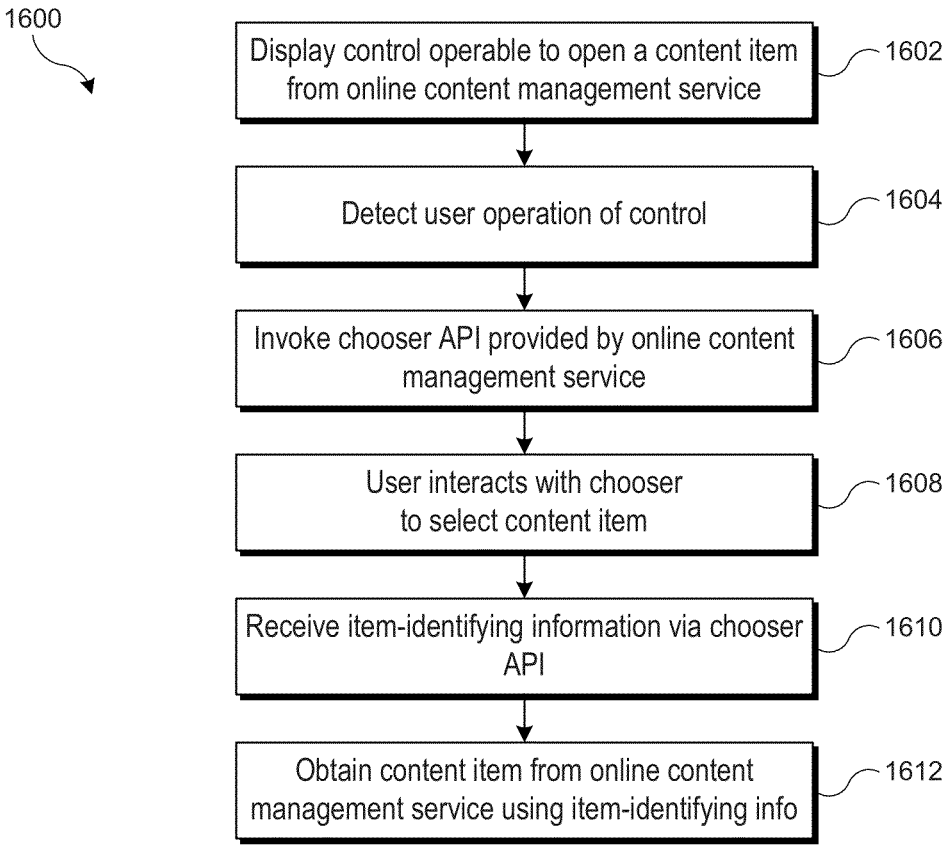
1600
Display control operable to open a content item from online content management service
1602
Detect user operation of control
1604
Invoke chooser API provided by online content management service
1606
User interacts with chooser to select content item
1608
Receive item-identifying information via chooser API
1610
Obtain content item from online content management service using item-identifying info
1612

FIG. 16

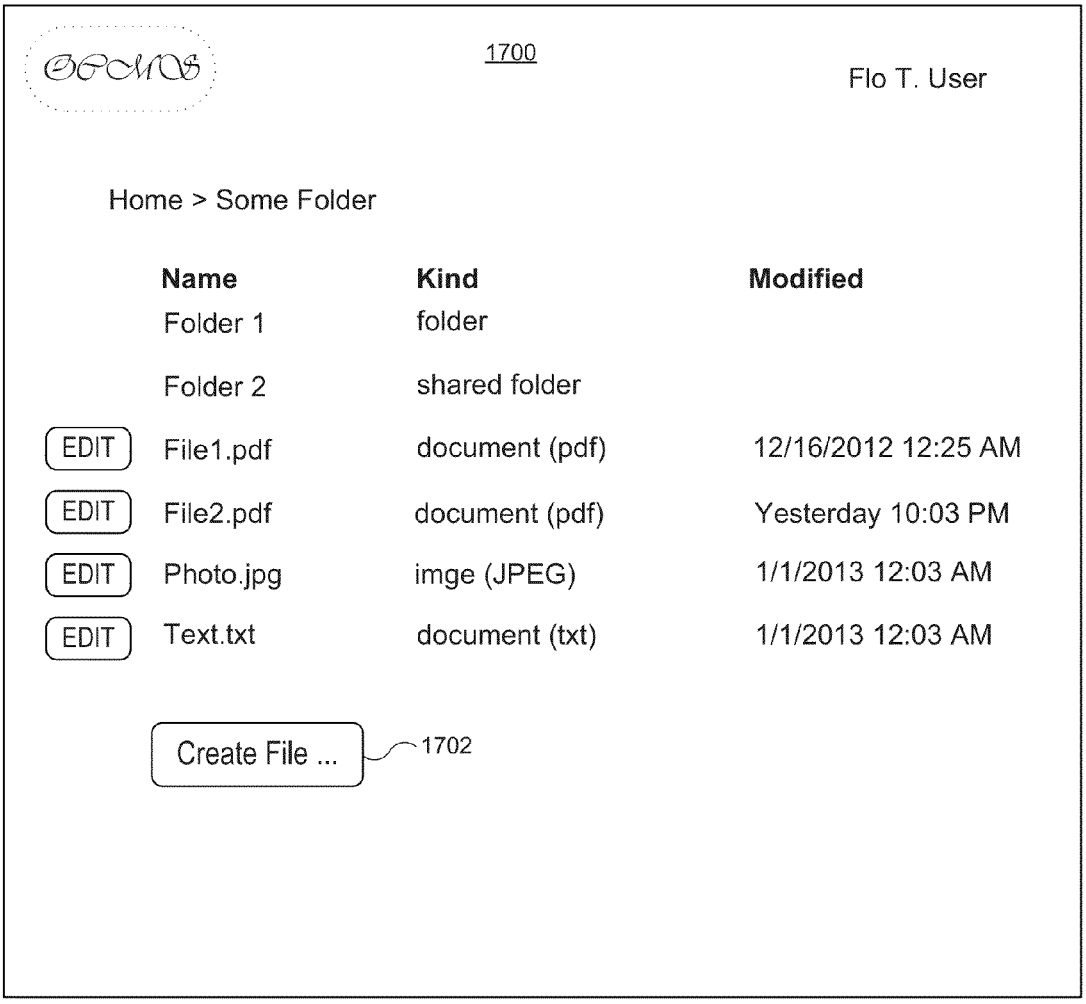
OCMS
1700
Flo T. User
Home > Some Folder
Name
Kind
Modified
Folder 1
folder
Folder 2
shared folder
EDIT
File1.pdf
document (pdf)
12/16/2012 12:25 AM
EDIT
File2.pdf
document (pdf)
Yesterday 10:03 PM
EDIT
Photo.jpg
imge (JPEG)
1/1/2013 12:03 AM
EDIT
Text.txt
document (txt)
1/1/2013 12:03 AM
Create File ...
1702

FIG. 17

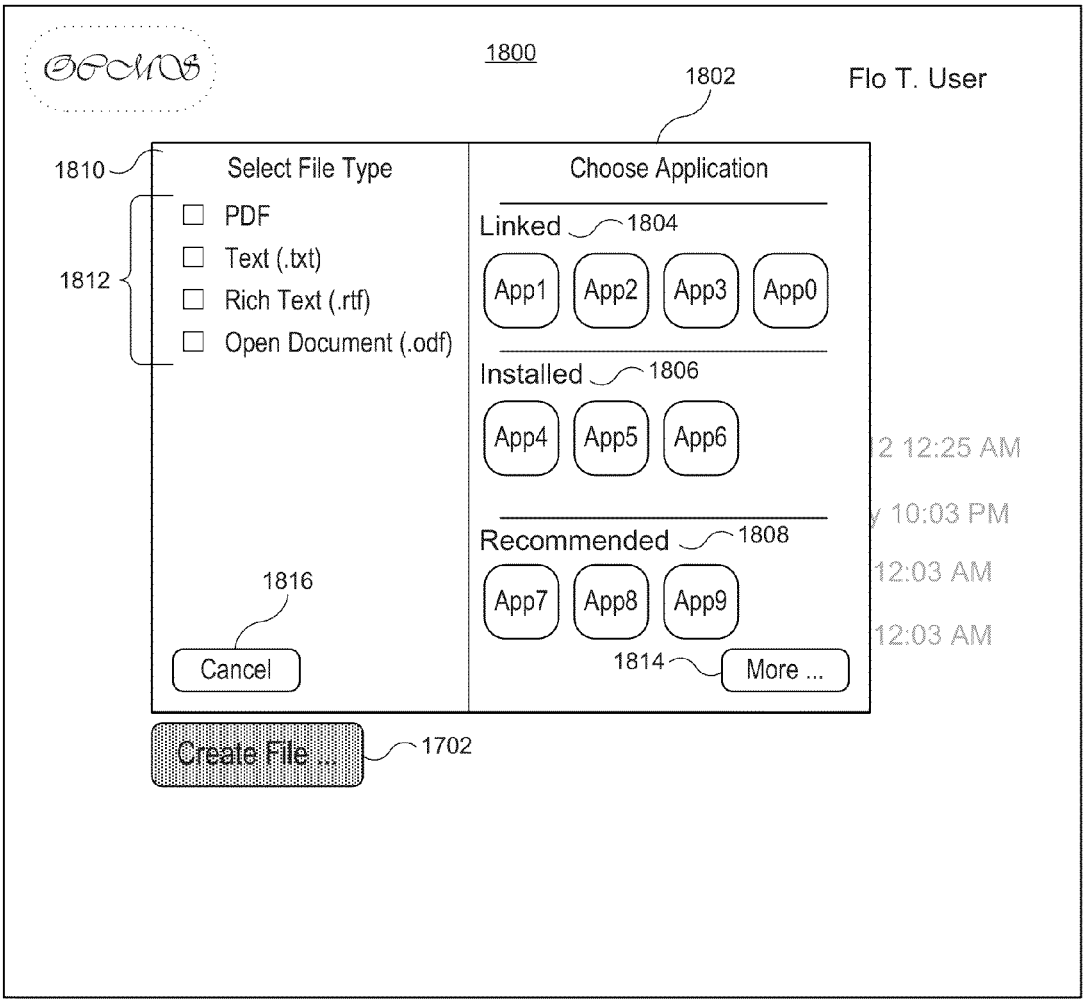
1800
1802
Flo T. User
1810
Select File Type
Choose Application
PDF
Text (.txt)
Rich Text (.rtf)
Open Document (.odf)
1812
Linked
1804
App1
App2
App3
App0
Installed
1806
App4
App5
App6
Recommended
1808
App7
App8
App9
1816
Cancel
1814
More ...
Create File ...
1702
2 12:25 AM
y 10:03 PM
12:03 AM
12:03 AM

FIG. 18

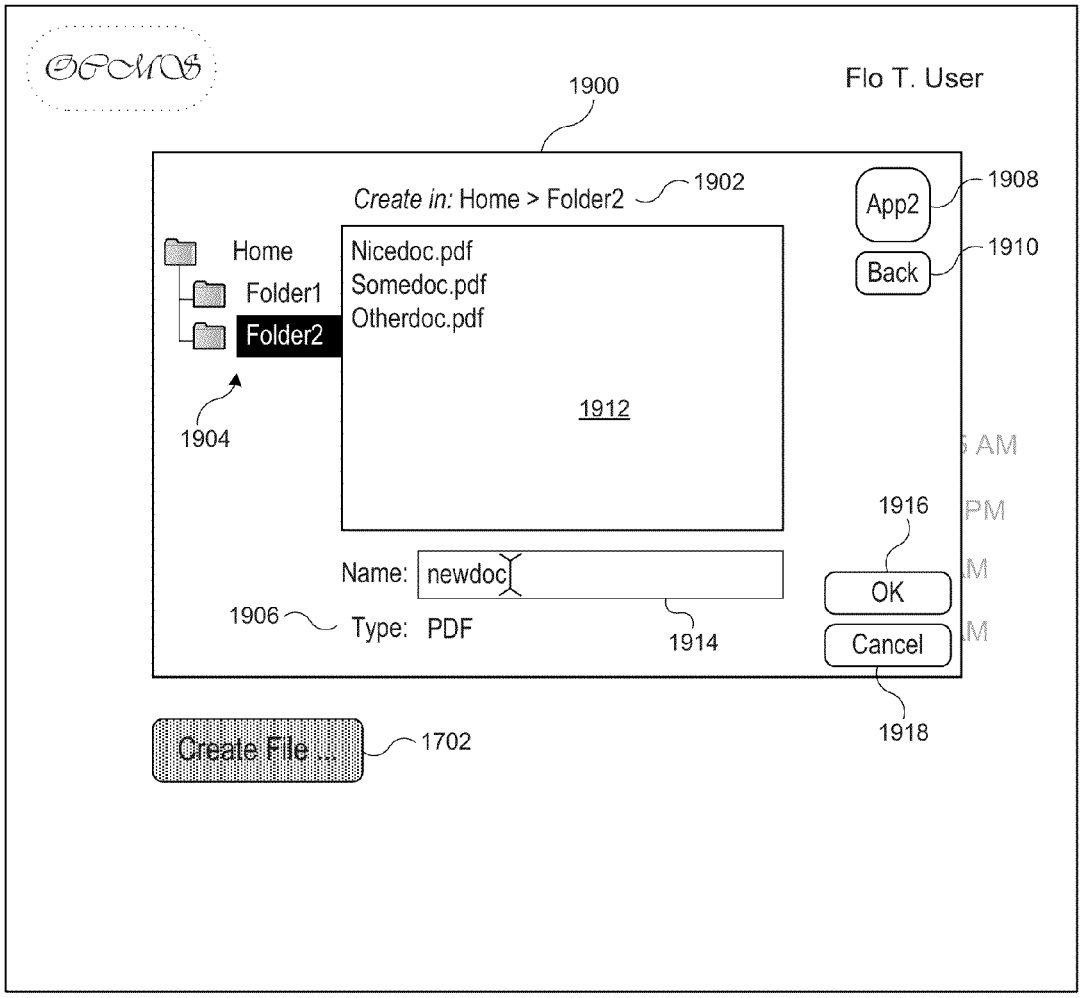
Flo T. User
1900
Create in: Home > Folder2
1902
App2
1908
Back
1910
Home
Folder1
Folder2
Nicedoc.pdf
Somedoc.pdf
Otherdoc.pdf
1912
1904
1916
Name: newdoc
OK
1906
Type: PDF
1914
Cancel
1918
Create File...
1702

FIG. 19

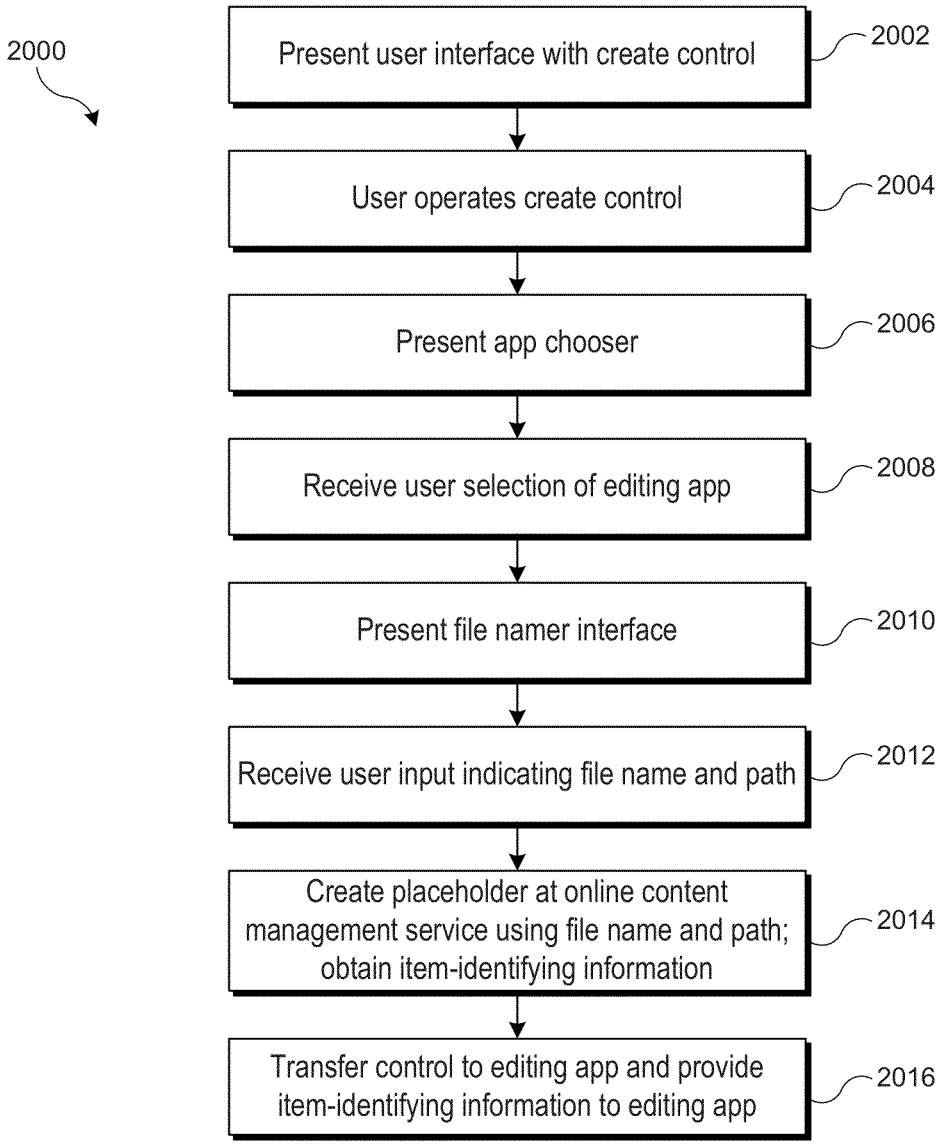
2000
Present user interface with create control
2002
User operates create control
2004
Present app chooser
2006
Receive user selection of editing app
2008
Present file namer interface
2010
Receive user input indicating file name and path
2012
Create placeholder at online content management service using file name and path; obtain item-identifying information
2014
Transfer control to editing app and provide item-identifying information to editing app
2016

FIG. 20

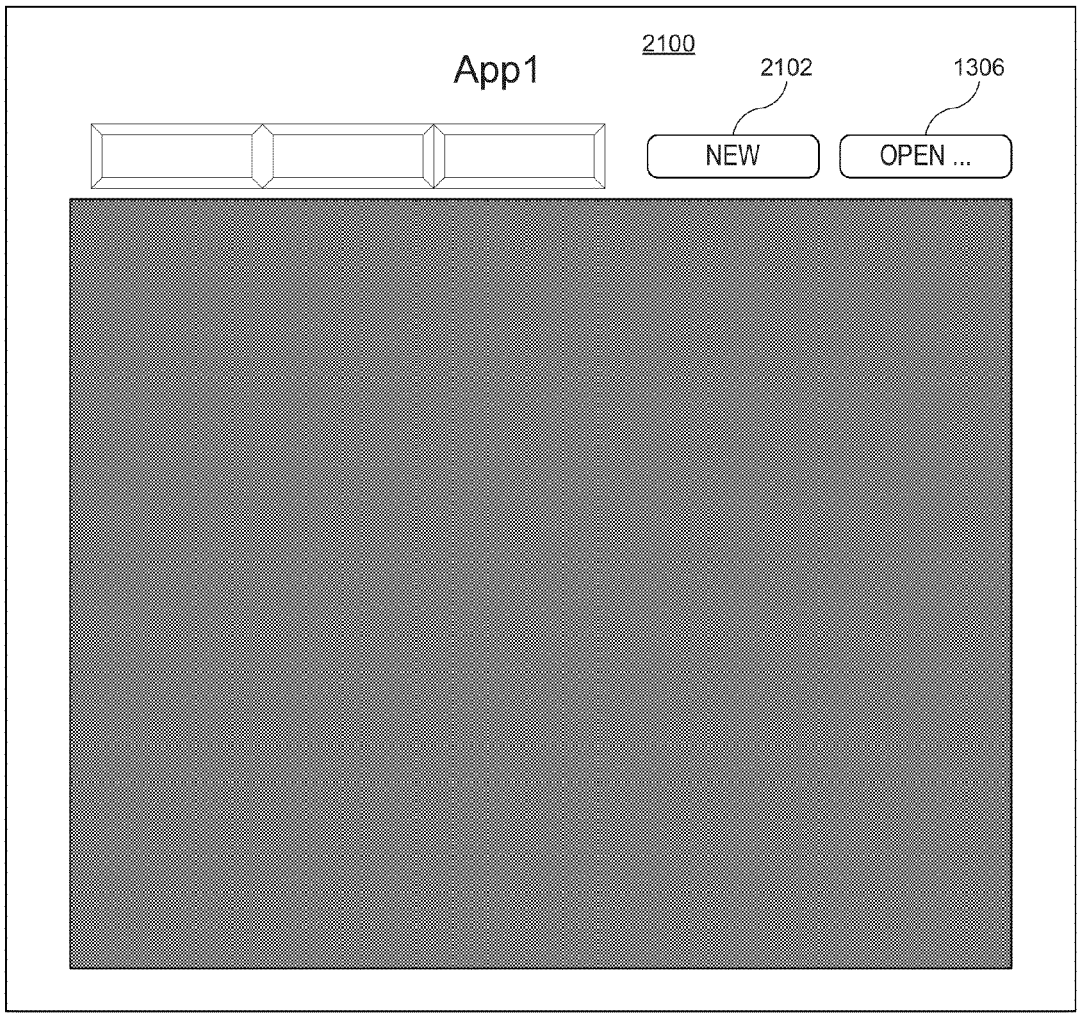

FIG. 21

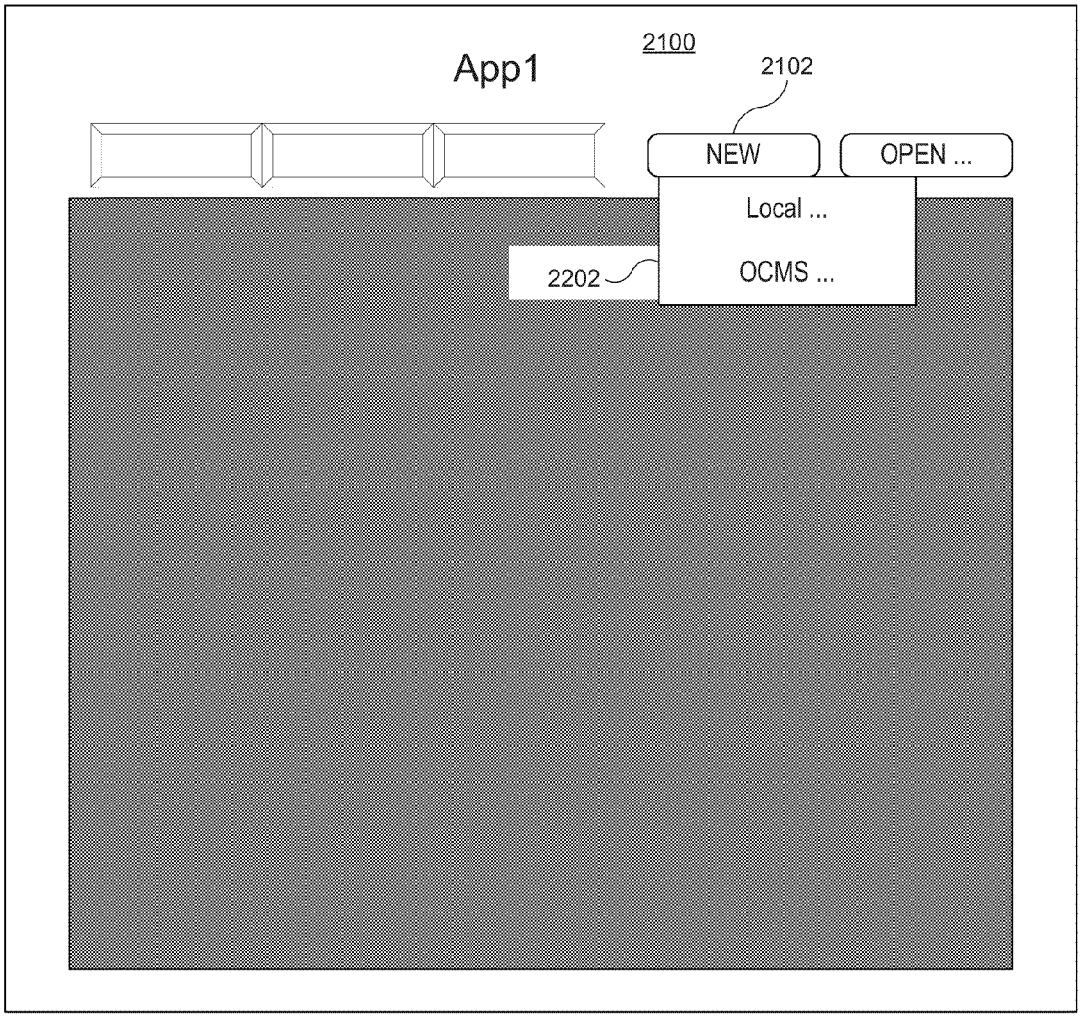

FIG. 22

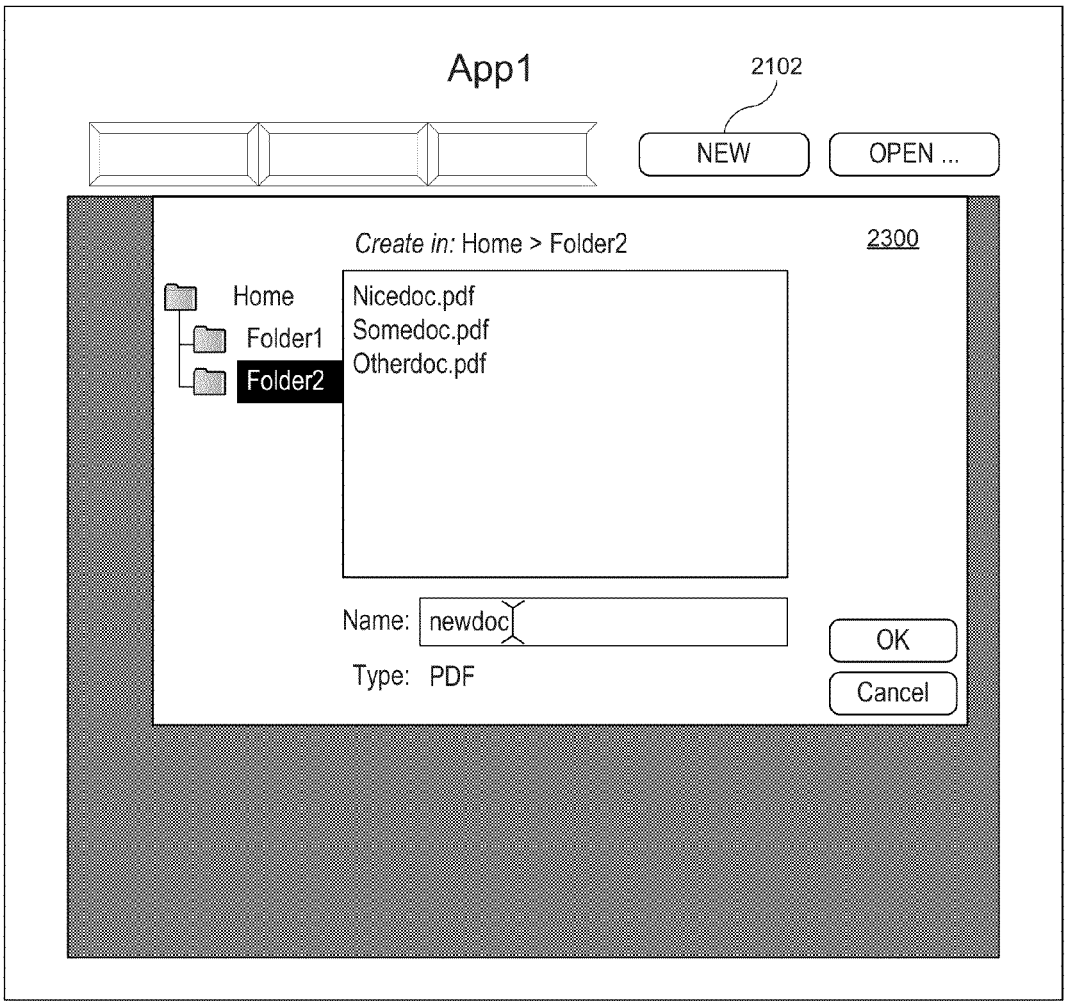
App1
2102
NEW
OPEN ...
Create in: Home > Folder2
2300
Home
Folder1
Folder2
Nicedoc.pdf
Somedoc.pdf
Otherdoc.pdf
Name: newdoc
Type: PDF
OK
Cancel

FIG. 23

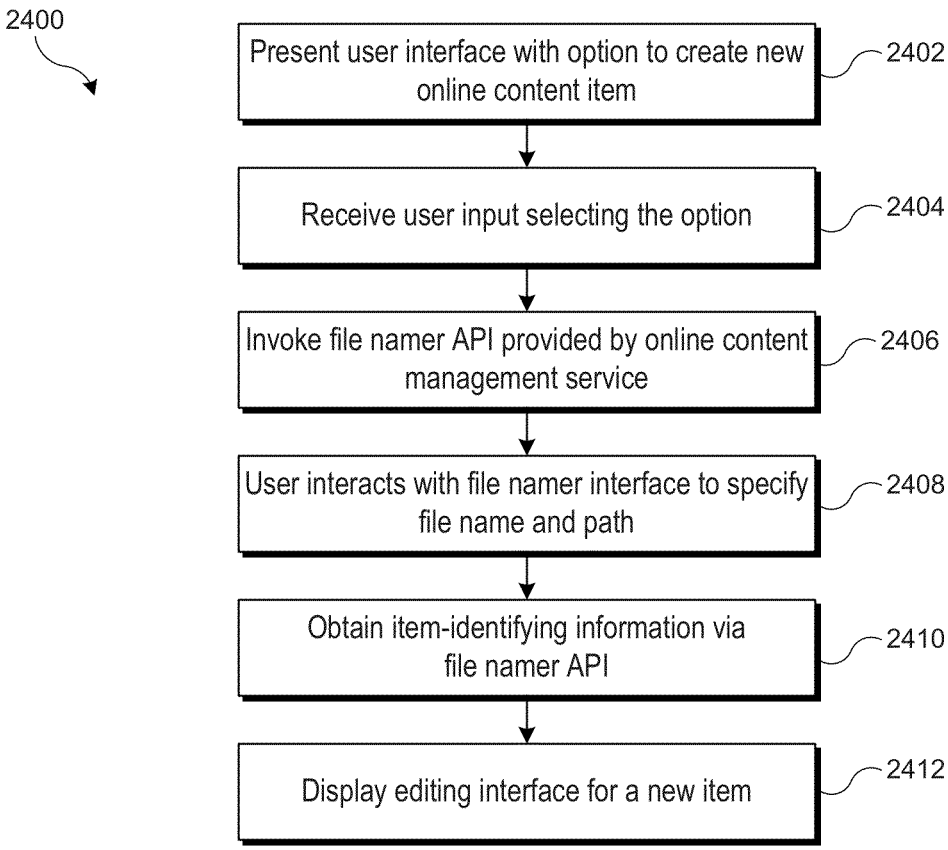
2400
Present user interface with option to create new online content item
2402
Receive user input selecting the option
2404
Invoke file namer API provided by online content management service
2406
User interacts with file namer interface to specify file name and path
2408
Obtain item-identifying information via file namer API
2410
Display editing interface for a new item
2412

FIG. 24

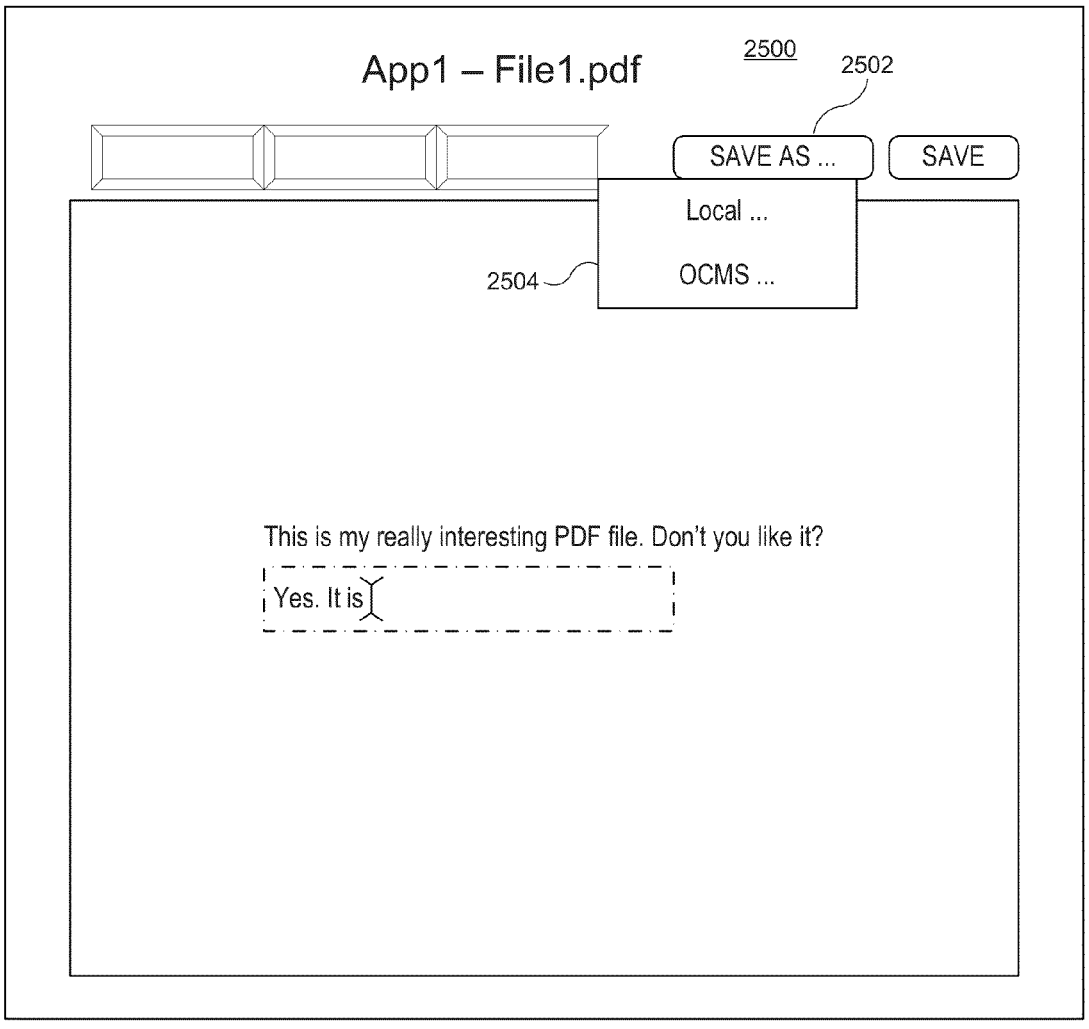
App1 – File1.pdf
2500
2502
SAVE AS ...
SAVE
Local ...
OCMS ...
2504
This is my really interesting PDF file. Don't you like it?
Yes. It is

FIG. 25

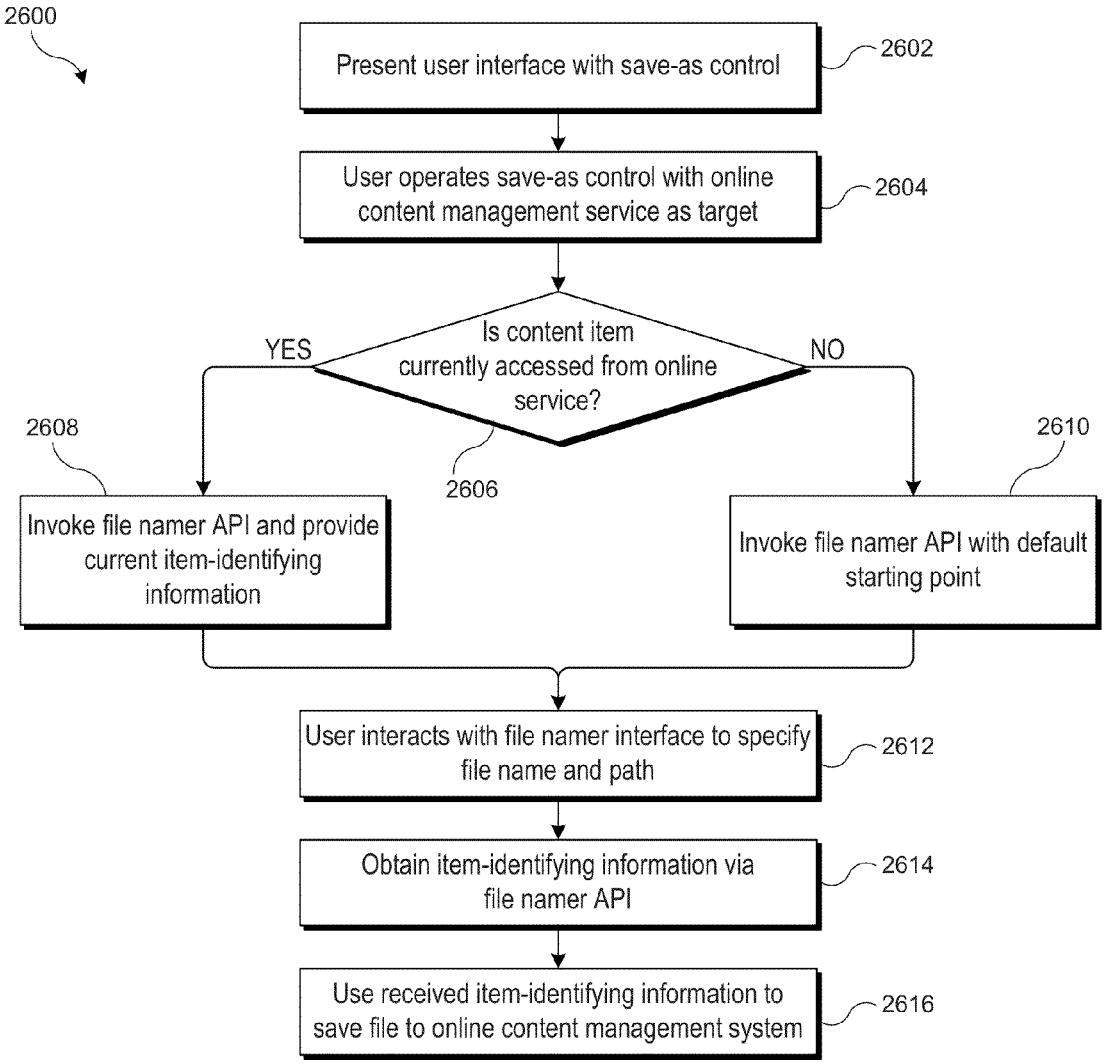
2600
Present user interface with save-as control
2602
User operates save-as control with online content management service as target
2604
Is content item currently accessed from online service?
YES
NO
2606
2608
Invoke file namer API and provide current item-identifying information
2610
Invoke file namer API with default starting point
User interacts with file namer interface to specify file name and path
2612
Obtain item-identifying information via file namer API
2614
Use received item-identifying information to save file to online content management system
2616

FIG. 26

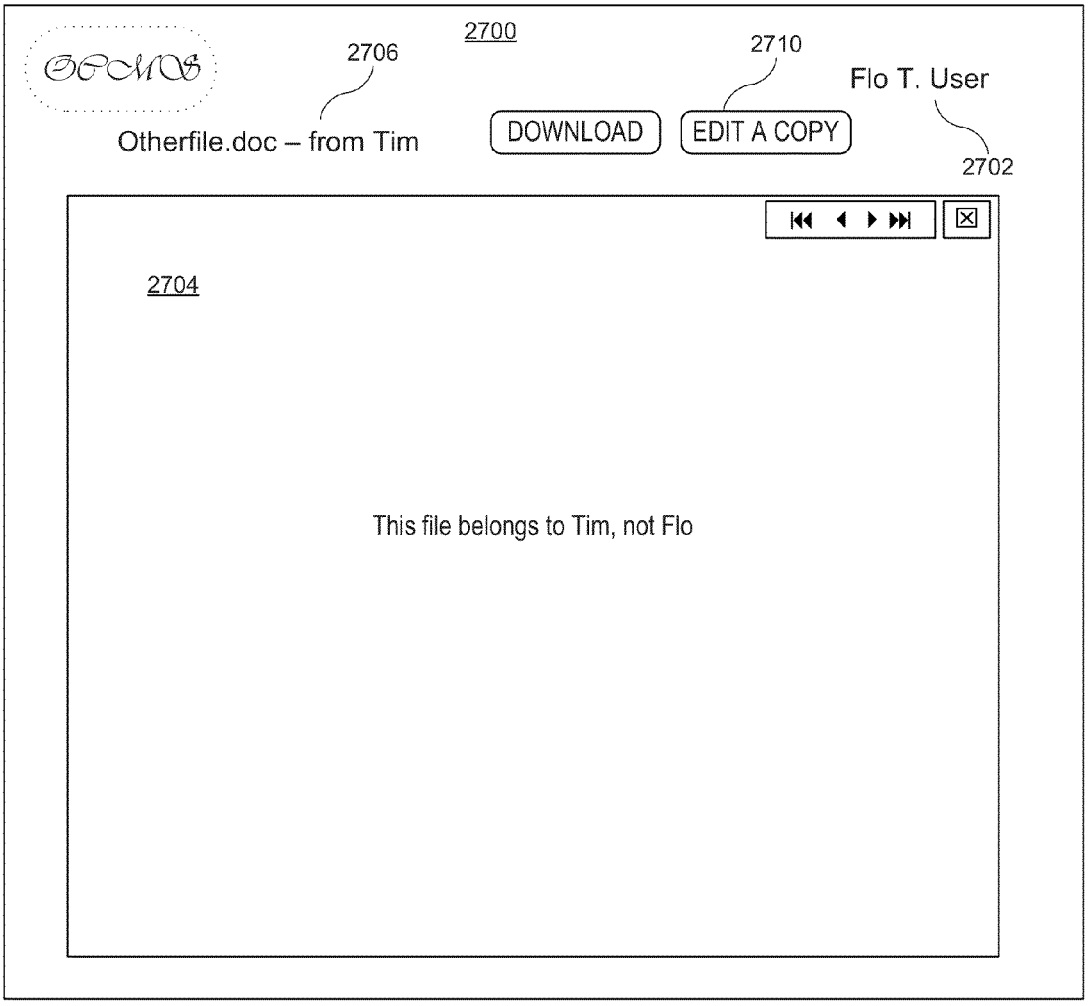
2700
2706
2710
Flo T. User
Otherfile.doc – from Tim
DOWNLOAD
EDIT A COPY
2702
2704
This file belongs to Tim, not Flo

FIG. 27

SEAMLESS EDITING AND SAVING OF ONLINE CONTENT ITEMS USING APPLICATIONS

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 61/764,392, filed Feb. 13, 2013, entitled "Seamless Editing and Saving of Online Content Items Using Applications," the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND

The present disclosure relates generally to online content management systems and in particular to seamless editing and saving of content items stored in an online content management system using application programs.

Online content management services allow users to access and manage content across multiple devices using the Internet. In a typical online content management service, a user establishes an account with the service provider and to associate various content items with the account. For example, some online content management services may allow the user to store content items (including but not limited to text documents; email messages; text messages; other types of messages; media files such as photos, videos, and audio files; and/or folders containing multiple files) and to selectively allow other users to access the content items. Content items can be stored in a master repository maintained by the service provider and mirrored to or synchronized with local copies on various user devices. Users may also be able to receive updates based on activity of other users; for instance, in a social network, status updates or other content items posted by one user can be propagated to other users who have indicated interest in receiving them.

Among other features, online content management services allow users to access content items from a variety of clients, such as web browsers, desktop application programs, and mobile-device apps. Users can modify content items stored on the online content management system and store the modified items in the system.

SUMMARY

In existing systems, modifying content items stored by an online content management service can be cumbersome for users. For example, a user may need to use an online content client application to download a local copy of the content item from the online content management service, open the local copy in an appropriate application for modifying it, modify the local copy, save the modification locally, then return to the online content client application to upload the modified local copy to the online content management service. This process can be tedious and error-prone; for example, the user may forget to upload the modified local copy or may upload the modified local copy to a different location.

Certain embodiments of the present invention relate to more seamless workflows for working with content items stored in an online content management service. For example, a user viewing a content item or listing of content items using an online content client application (also referred to as a "client app") can, from within that application, launch an operating application to operate on the content item. An "operating application." or "operating app," as used herein can refer to any application capable of performing operations (e.g., editing, printing, transmitting, digitally signing, or creating) on content items of a given type (or types); such applications can be provided by a provider of the online content management system or a third party. The operating application can interact with the online content management provider to obtain a current copy of the content item and to save a modified content item back to the online content management service, e.g., if the user instructs the operating application to save the item. Interactions between the client application, the operating application and the online content management service can occur without requiring the user to manually initiate upload or download of any content items.

In some embodiments, a user can, from within a client application provided by an online content management service, open a content item stored on the online content management service using an operating application (which can be provided by a third party), modify the content item, and save the modified content item back to the online content management service. From the user's perspective, this interaction can appear as seamless as working with a locally stored content item.

In some embodiments, a user can, from within an operating application, open a content item stored on the online content management service, modify the content item, and save the modified content item back to the online content management service. From the user's perspective, this interaction can appear as seamless as working with a locally stored content item.

In some embodiments, a user can create new content items from within an operating application and have the new item stored on the online content management service. Again, this interaction can appear seamless to the user.

The following detailed description together with the accompanying drawings will provide a better understanding of the nature and advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows user devices interacting with an online content management service according to an embodiment of the present invention.

FIG. **2** shows a simplified block diagram of a representative computer system.

FIG. **3** shows a user interface for a client app according to an embodiment of the present invention.

FIG. **4** shows a preview interface for a client app according to an embodiment of the present invention.

FIG. **5** shows an app chooser interface according to an embodiment of the present invention.

FIGS. **6**A and **6**B illustrate editing interfaces according to various embodiments of the present invention.

FIG. **7** shows an interface that can appear when control is returned to the client app according to an embodiment of the present invention.

FIG. **8** shows a flow diagram of a process for launching an editing app to edit an online content item according to an embodiment of the present invention.

FIG. **9** shows a flow diagram of a process for selecting an editing app according to an embodiment of the present invention.

FIG. **10** shows a flow diagram of a process for editing a content item that is stored at an online content management service according to an embodiment of the present invention.

FIG. **11** shows an interface for viewing an image according to an embodiment of the invention.

FIG. **12** shows an interface for viewing multiple images according to an embodiment of the present invention.

FIG. **13** shows an interface for an editing app according to an embodiment of the present invention.

FIG. **14** shows an interface with a file selection dialog box according to an embodiment of the present invention.

FIG. **15** shows a content item chooser interface according to an embodiment of the present invention.

FIG. **16** shows a flow diagram of a process for opening a content item in an editing app according to an embodiment of the present invention.

FIG. **17** shows a user interface for a client app according to an embodiment of the present invention.

FIG. **18** shows an app chooser interface according to an embodiment of the present invention.

FIG. **19** shows a file naming interface according to an embodiment of the present invention.

FIG. **20** is a flow diagram of a process for creating a new document according to an embodiment of the present invention.

FIG. **21** shows a user interface for an editing app that supports file creation according to an embodiment of the present invention.

FIG. **22** shows a menu interface that can be invoked from the interface of FIG. **21** according to an embodiment of the present invention.

FIG. **23** shows a file namer interface according to an embodiment of the present invention.

FIG. **24** is a flow diagram of a process for creating a content item within an editing app according to an embodiment of the present invention.

FIG. **25** shows an interface for an editing app with a "save as" option according to an embodiment of the present invention.

FIG. **26** shows a flow diagram of a process for a save-as operation according to an embodiment of the present invention.

FIG. **27** shows a preview interface according to an embodiment of the present invention.

DETAILED DESCRIPTION

Certain embodiments of the present invention relate to more seamless workflows for working with content items stored in an online content management service. For example, a user viewing a content item or listing of content items using an online content client application (also referred to as a "client app") can, from within that application, launch an operating application to operate on the content item. An "operating application," or "operating app," as used herein can refer to any application capable of performing operations (e.g., editing, printing, transmitting, digitally signing, or creating) on content items of a given type (or types); such applications can be provided by a provider of the online content management system or a third party. The operating application can interact with the online content management provider to obtain a current copy of the content item and to save a modified content item back to the online content management service, e.g., if the user instructs the operating application to save the item. Interactions between the client application, the operating application and the online content management service can occur without requiring the user to manually initiate upload or download of any content items.

In some embodiments, a user can, from within a client application provided by an online content management service, open a content item stored on the online content management service using an operating app (which can be provided by a third party), modify the content item, and save the modified content item back to the online content management service. From the user's perspective, this interaction can appear as seamless as working with a locally stored content item.

In some embodiments, a user can, from within an operating application, open a content item stored on the online content management service, modify the content item, and save the modified content item back to the online content management service. From the user's perspective, this interaction can appear as seamless as working with a locally stored content item.

In some embodiments, a user can create new content items from within an operating application and have the new item stored on the online content management service. Again, this interaction can appear seamless to the user.

FIG. **1** shows user devices interacting with an online content management service **100** according to an embodiment of the present invention. Online content management service (sometimes abbreviated as "OCMS") **100** can include, for example, a file storage service, a file sharing service, a social media service that allows users to post and edit messages and/or other content, and so on. In some embodiments, online content management service **100** can provide file storage, sharing, and synchronization for users across multiple platforms. Online content management service **100** can be hosted on servers **130** maintained by a service provider and accessed via a network **102**, such as the Internet.

Users can access online content management service **100** using various application programs executing on user devices such as a desktop (or laptop) computer **112**, tablet computer **114**, and/or smart phone **116**. In general, different user devices **112**, **114**, **116** can implement different operating platforms (a "platform" refers to a combination of hardware and operating system software). The provider of online content management service **100** and/or various third parties can provide application programs (also referred to herein as "apps") adapted to various platforms; application programs are generally programs that are launchable on request of the user, although some applications may also be automatically launched under some circumstances. In embodiments described herein, some or all application programs can allow the user to access content items stored on online content management service **100**; such access can include adding items, deleting items, modifying items, and/or organizing items (e.g., using a folder hierarchy).

For example, desktop computer **112** can implement a desktop operating system ("OS") **120** and various applications that are executable on desktop OS **120**, such as web browser **122**, text editor **124**, photo editor **126**, and word processor **128**. Web browser **122** (which can be, e.g., the INTERNET EXPLORER® web browser (a product of MICROSOFT CORP.), the GOOGLE CHROME® web browser (a product of GOOGLE INC.), the SAFARI® web browser (a product of APPLE INC.), or similar software) can be operable to interact with various servers via network **102**, including servers **130** associated with online content management service **100**. In some embodiments, web browser **122** can interact with servers **130** to execute a browser-based OCMS client app **132** that can access content on service **100**. Program code implementing browser-based client app **132** can be stored on desktop computer **112** or delivered to desktop computer **112** on an as-needed basis by servers **130**; for example, code implementing client app **132** can be downloaded when browser **122** accesses servers **130**.

As another example, tablet computer **114** can implement a tablet OS **134** (e.g., the ANDROID® operating system (a product of the OPEN HANDSET ALLIANCE), the APPLE iOS operating system (a product of APPLE INC.), or the like)

and various apps that are executable on the tablet OS. These apps can include an OCMS client app **136** supplied by the provider of online content management service **100**. Other apps can also be present, such as text editor **138** and photo ordering app **140**.

Similarly, smart phone **116** can implement a phone OS **142** (e.g., the ANDROID operating system or the APPLE iOS operating system as mentioned above, or the like) and various apps that are executable on the phone OS. These apps can include an OCMS client app **144** supplied by the provider of online content management service **100**. Other apps can also be present, such as text editor **146** and PDF signer **148**.

Online content management service **100** can manage a data store **150** of content items. In some embodiments, some or all of the content items in data store **150** are "owned" by particular users and are visible only to that user and potentially others to whom the user has granted access. For example, in one implementation, content items data store **150** can be organized around records of user accounts, such as account record **152**. Account record **152** can be associated with a unique user identifier and can include user information **154** (e.g., user name, password, email address) and information **156** about content items **158** that have been stored by the account's user in data store **150**. In some embodiments, information **156** may include the actual content items **158**; in other embodiments, information **156** may provide references to locations where actual content items **158** are stored.

In operation, a user may establish an account with online content management service **100**; this can involve, e.g., creating a user record **152**. Once the account is established, the user can access the account from any device (including any of devices **112**, **114**, **116**) by using a suitable OCMS client app (e.g., any of OCMS client apps **132**, **136**, **144**). Accessing the account can include, e.g., providing appropriate credentials (e.g., a username and password) through a user interface of client app **132**, **136**, **144**. In some embodiments, a persistent link between the client app and the account can be established when the user first enters credentials; accordingly, the user need not be prompted to enter credentials each time an OCMS client app is launched.

Using an OCMS client app and/or other apps, a user can create, modify and/or delete content items **158** associated with the user's account record **152**. In some embodiments, an OCMS client app can also allow the user to organize content items **158**, e.g., using a folder hierarchy or other structures. In some embodiments, an OCMS client app can also provide an interface allowing the user to selectively share content items with other users; accordingly, multiple users may have access to the same content item.

As used herein, an OCMS client app (also referred to simply as a "client app") refers to an app provided by the operator of online content management service **100** and adapted to interact with servers **130**. In some embodiments, the user can also link other apps (e.g., any of apps **124**, **126**, **128**, **138**, **140**, **146**, **148**) to the account, and such apps may thereafter be able to access the account. For example, text editor app **124** (or any other app) can provide an interface that prompts the user to enter her account credentials, e.g., when app **124** is first launched or when a user selects a "link" option from a settings menu. App **124** can transmit the account credentials and an identifier of itself to servers **130**. A link between app **124** and the user's account record **152** can be established if servers **130** successfully verify the user's credentials. As with a client app, linking another app to a user's account can allow the app to access content items stored by online client management service **100** (such items are also referred to herein as "online content items"). In some embodiments online content management service **100** can maintain a record of linked apps **160**. As described below, in some instances an app may be allowed to access one or more of a user's online content items without having established a link.

In some embodiments, client apps (e.g., apps **132**, **136**, **144**) may provide limited (or no) interfaces for editing or modifying content items stored by online content management service **100**. However, a client app (e.g., apps **132**, **136**, **144**) can interact with other apps available on the same user device (e.g., app **132** can interact with any of apps **124**, **126**, **128**) to allow the user to edit content items in an intuitive, seamless manner. Specific examples of such interactions are described below.

It will be appreciated that the systems shown in FIG. **1** are illustrative and that variations and modifications are possible. User devices can include any type of computing device and are not limited by form factor, particular hardware components, operating systems, or the like. Any app or combination of apps can be installed or supported on a given user device, and different user devices may have the same apps, similar apps, and/or different apps or combinations of apps. Any type of content item can be stored and managed using online content management service **100**. Examples include documents (e.g., text documents, word-processor documents, Portable Document Format (PDF) files), email messages, text messages, other types of messages, media files (e.g., photos, audio, video), and/or folders containing multiple files. Online content management service **100** can organize the information it stores in any manner desired and can store information locally (e.g., at a central data and server warehouse facility) or in a distributed manner.

Various operations described herein can be implemented on computer systems, which can include systems of generally conventional design. FIG. **2** shows a simplified block diagram of a representative computer system **200**. In various embodiments, computer system **200** or similar systems can implement a user device (e.g., any of devices **112**, **114**, **116** of FIG. **1**) or a server (e.g., one or more of servers **130** of FIG. **1**). Computer system **200** can include processing unit(s) **205**, storage subsystem **210**, input devices **220**, output devices **225**, network interface **235**, and bus **240**.

Processing unit(s) **205** can include a single processor, which can have one or more cores, or multiple processors. In some embodiments, processing unit(s) **205** can include a general-purpose primary processor as well as one or more special-purpose co-processors such as graphics processors, digital signal processors, or the like. In some embodiments, some or all processing units **205** can be implemented using customized circuits, such as application specific integrated circuits (ASICs) or field programmable gate arrays (FPGAs). In some embodiments, such integrated circuits execute instructions that are stored on the circuit itself. In other embodiments, processing unit(s) **205** can execute instructions stored in storage subsystem **210**.

Storage subsystem **210** can include various memory units such as a system memory, a read-only memory (ROM), and a permanent storage device. The ROM can store static data and instructions that are needed by processing unit(s) **205** and other modules of computer system **200**. The permanent storage device can be a read-and-write memory device. This permanent storage device can be a non-volatile memory unit that stores instructions and data even when computer system **200** is powered down. Some embodiments of the invention can use a mass-storage device (such as a magnetic or optical disk or flash memory) as a permanent storage device. Other embodiments can use a removable storage device (e.g., a floppy disk, a flash drive) as a permanent storage device. The

system memory can be a read-and-write memory device or a volatile read-and-write memory, such as dynamic random access memory. The system memory can store some or all of the instructions and data that processing unit(s) **205** need at runtime.

Storage subsystem **210** can include any combination of computer readable storage media including semiconductor memory chips of various types (DRAM, SRAM, SDRAM, flash memory, programmable read-only memory) and so on. Magnetic and/or optical disks can also be used. In some embodiments, storage subsystem **210** can include removable storage media that can be readable and/or writeable; examples of such media include compact disc (CD), read-only digital versatile disc (e.g., DVD-ROM, dual-layer DVD-ROM), read-only and recordable Blue-Ray disks, ultra density optical disks, flash memory cards (e.g., SD cards, mini-SD cards, micro-SD cards, etc.), magnetic disks, and so on. The computer readable storage media do not include carrier waves and transitory electronic signals passing wirelessly or over wired connections.

In some embodiments, storage subsystem **210** can store one or more software programs to be executed by processing unit(s) **205**, such as an operating system (e.g., operating systems **120**, **134**, **132** of FIG. **1**), a browser app (e.g., web browser **122**), an OCMS client app (e.g., apps **132**, **126**, **144**), apps for operating on local and/or online content items (e.g., apps **124**, **126**, **128**, **138**, **140**, **146**, **148**), and so on. "Software" refers generally to sequences of instructions that, when executed by processing unit(s) **205** cause computer system **200** to perform various operations, thus defining one or more specific machine implementations that execute and perform the operations of the software programs. The instructions can be stored as firmware residing in read-only memory and/or applications stored in non-volatile storage media that can be read into volatile working memory for execution by processing unit(s) **205**. Software can be implemented as a single program or a collection of separate programs or program modules that interact as desired. From storage subsystem **310**, processing unit(s) **205** can retrieve program instructions to execute and data to process in order to execute various operations described herein.

A user interface can be provided by one or more user input devices **220** and one or more user output devices **225**. Input devices **220** can include any device via which a user can provide signals to computer system **200**; computer system **200** can interpret the signals as indicative of particular user requests or information. In various embodiments, input devices **220** can include any or all of a keyboard, touch pad, touch screen, mouse or other pointing device, scroll wheel, click wheel, dial, button, switch, keypad, microphone, and so on.

User output devices **225** can include any device via which computer system **200** can provide information to a user. For example, user output devices **225** can include a display to display images generated by computer system **200**. The display can incorporate various image generation technologies, e.g., a liquid crystal display (LCD), light-emitting diode (LED) including organic light-emitting diodes (OLED), projection system, cathode ray tube (CRT), or the like, together with supporting electronics (e.g., digital-to-analog or analog-to-digital converters, signal processors, or the like). Some embodiments can include a device such as a touchscreen that function as both input and output device. In some embodiments, other user output devices **225** can be provided in addition to or instead of a display. Examples include indicator lights, speakers, tactile "display" devices, printers, and so on.

In some embodiments, input device **220** and output devices **225** can interoperate to provide a graphical user interface ("GUI") that allows a user to interact with computer system **200** by using an input device to select a control element displayed on the screen (e.g., by operating a pointing device such as a mouse or touching the location where a control element is displayed on a touch screen).

Network interface **235** can provide voice and/or data communication capability for computer system **200**. In some embodiments, network interface **235** can include radio frequency (RF) transceiver components for accessing wireless voice and/or data networks (e.g., using cellular telephone technology, advanced data network technology such as 3G, 4G or EDGE, WI-FI wireless networking technology (i.e., any wireless local area network product based on INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS' (IEEE) 802.11 family standards and promulgated by the WI-FI ALLIANCE), or other mobile communication technologies, or any combination thereof), GPS receiver components, and/or other components. In some embodiments, network interface **235** can provide wired network connectivity (e.g., Ethernet) in addition to or instead of a wireless interface. Network interface **235** can be implemented using a combination of hardware (e.g., antennas, modulators/demodulators, encoders/decoders, and other analog and/or digital signal processing circuits) and software components.

Bus **240** can include various system, peripheral, and chipset buses that communicatively connect the numerous components of computer system **200**. For example, bus **240** can communicatively couple processing unit(s) **205** with storage subsystem **210**. Bus **240** can also connect to input devices **220** and output devices **225**. Bus **240** can also couple computing system **200** to a network through network interface **235**. In this manner, computer system **200** can be a part of a network of multiple computer systems (e.g., a local area network (LAN), a wide area network (WAN), an intranet, or a network of networks, such as the Internet.

Some embodiments include electronic components, such as microprocessors, storage and memory that store computer program instructions in a computer readable storage medium. Many of the features described in this specification can be implemented as processes that are specified as a set of program instructions encoded on a computer readable storage medium. When these program instructions are executed by one or more processing units, they cause the processing unit(s) to perform various operation indicated in the program instructions. Examples of program instructions or computer code include machine code, such as is produced by a compiler, and files including higher-level code that are executed by a computer, an electronic component, or a microprocessor using an interpreter.

Through suitable programming, processing unit(s) **205** can provide various functionality for computer system **200**. For example, in tablet computer **114**, processing unit(s) **205** can execute operating system **134**, client app **136**, and various operating apps **138**, **140** that provide interfaces operable by the user to interact with content items. In desktop computer **112**, processing unit(s) **205** can execute operating system **120** and browser application **122**, which provides the ability to retrieve and display content items from various sources (e.g., using HTTP or other data transfer protocols to retrieve and display web pages) and the ability to receive and interpret user input pertaining to retrieved content items. A user can operate browser application **122** to interact with online content management service **100**, and such interaction can include executing browser-based client app **132**. Desktop

computer **112** can also execute various operating apps **124**, **126**, **128** that provide interfaces operable by the user to interact with content items.

In some embodiments, aspects of online content management system **100** of FIG. **1** can also be implemented using computer systems similar to system **200**. For example, servers **130** can be implemented using one or more instances of system **200**, and software executing on these systems can implement various operational modules, such as a user authentication module, a web server module to process HTML requests or other data requests from remote systems, a database search module to search content data store **150**, a database management module to facilitate storage and retrieval of content items from content data store **150**, application program interfaces ("APIs") to support other applications' ability to locate and/or create content items (examples are described below), and so on. In server embodiments, a user interface may be located remotely from processing unit(s) **205** and/or storage subsystem **210**; similarly, storage subsystem **210** or portions thereof may be located remotely from processing unit(s) **205**. Accordingly, in some instances, various components of computer system **200** need not be physically located in any particular proximity to each other.

It will be appreciated that computer system **200** is illustrative and that variations and modifications are possible. Computer system **200** can have other capabilities not specifically described here (e.g., mobile phone, global positioning system (GPS), power management, one or more cameras, various connection ports for connecting external devices or accessories, etc.). Further, while computer system **200** is described with reference to particular blocks, it is to be understood that these blocks are defined for convenience of description and are not intended to imply a particular physical arrangement of component parts. Further, the blocks need not correspond to physically distinct components. Blocks can be configured to perform various operations, e.g., by programming a processor or providing appropriate control circuitry, and various blocks might or might not be reconfigurable depending on how the initial configuration is obtained. Embodiments of the present invention can be realized in a variety of apparatus including electronic devices implemented using any combination of circuitry and software.

Certain embodiments of the present invention can facilitate editing of or other operations on content items stored by online content management service **100** of FIG. **1** using any of user devices **112**, **114**, **116** (or other user devices). For example, editing can be facilitated through interaction between client app **132** of FIG. **1** (or client apps **136** or **144**) and an "editing app" such as any of apps **124**, **126**, **128** that provides an interface for editing content items. As used herein, the term "editing" includes modifying any aspect of the content item, including content, formatting, metadata, and the like. Examples of editing apps include text editors (e.g., apps **124**, **138**, **146**), word processors (e.g., app **128**), presentation editing software, spreadsheet applications, photo editing software (e.g., app **126**), video editing software, applications that provide digital-signature functionality (e.g., app **148**), and so on. Editing apps can be specialized for content items having particular data formats (also referred to as "content types" or "file types"), and content items of different types can be distinguished, e.g., based on a filename extension appended to the content item's name (e.g., ".pdf," ".doc," ".txt," ".jpg" and so on) and/or metadata associated with the content item.

Examples of workflow for editing a content item stored by online content management service **100** will now be described. FIG. **3** shows a user interface **300** for a client app (e.g., client app **132**, **136**, **144** of FIG. **1**) according to an embodiment of the present invention. Interface **300** can be displayed, e.g., within a browser executing on a user device (such as user device **112** executing browser **122**) or in a standalone window or in a full-screen mode as desired. Interface **300** can show a list **302** of online content items associated with the user's account, along with information about each content item such as name **304**, type **306**, and modification date **308**. In some embodiments, headers **304**, **306**, **308** can be user-operable control elements, allowing the user to sort list **302**, e.g., by clicking on or otherwise selecting the header to be used for the sort. Other information, such as an identifier of the user **310** and a current path **312** within a folder hierarchy, can also be shown.

Interface **300** can provide controls operable to invoke editing of content items in listing **302**, such as edit buttons **314**, **316**. In this example, each editable content item has a different edit button associated with it, and the user can select an item for editing by operating the corresponding edit button. In this example, content items that are folders do not have edit buttons; however, it is to be understood that folders can be modified, e.g., by adding or deleting content items, by changing the folder name, or by moving the folder to a new location within a hierarchy of folders. Such operations can be handled by client app **132** (or **134** or **136**) interacting with online content management service **100**; a detailed description is omitted.

In this example, content items that have edit buttons **314**, **316** can be edited by invoking an editing app that is distinct from the client app that displays interface **300**. Editing apps can be provided by third parties (or by the provider of the online content service) and can be operable independently from online client management service, e.g., to edit content items stored locally on the user device. In embodiments described herein, an editing app can interact with online content management service **100** and/or a client app to facilitate editing of content items that are stored and managed by online content management service **100**. For example, an editing app can be invoked for a particular content item, e.g., in response to the user operating the corresponding edit button **312** in interface **300**.

Edit buttons can be provided in other user interfaces in client app **132** (or **134** or **136**). For example, FIG. **4** shows a preview interface **400** for a client app **132** according to an embodiment of the present invention. Preview interface **400** can be invoked, e.g., if a user selects a content item from interface **300** by clicking on the item's name in listing **302** or otherwise indicates a desire to preview a particular content item.

Preview interface **400** can display the name of the content item in region **402** and a representation of all or part of the content of the item in region **404**. If the item has multiple pages, preview interface **400** can provide page navigation controls **406**. A close button **408** can be provided to close the preview, e.g., returning to the file listing interface **300**.

Interface **400** can also include other user-operable controls such as a download button **412** that can be operated to initiate a download of the previewed item to the client device, an edit button **414** that can operate similarly to edit button **312** of FIG. **3**, and a share button **416** that can be operated to share the content item with other users (e.g., by providing a link to the content item).

In some embodiments, when a user operates an edit button (e.g., edit button **316** of FIG. **3** or edit button **414** of FIG. **4**), the client app interacts with an editing app to allow editing of the content item. Depending on the file type of the content item and platform of a particular client device, there may be

multiple editing apps that are capable of editing the item. Accordingly, in some embodiments, operation of an edit button can invoke an "app chooser" interface via which a user can select an app to be used as the editing app.

FIG. **5** shows an app chooser interface according to an embodiment of the present invention. In this example, the user has activated edit button **414** of FIG. **4**, and in response an app chooser interface **502** has been displayed as an overlay. It is to be understood that activating edit button **312** of FIG. **3** can also result in app chooser interface **502** being displayed. App chooser interface **502** can provide a list or menu of editing apps from which the user can select a desired editing app to be invoked.

In some embodiments, any app capable of editing content items of the same file type as the selected content item can be listed in app chooser interface **502**, and any number of editing apps can be listed. In the example of FIG. **5**, the editing apps are categorized as "linked" (section **504**), "installed" (section **506**), and "recommended" (section **508**). More button **510** can be provided to allow the user to search for other apps, e.g., by navigating to an online app source (e.g., the APP STORE® online application service provided by APPLE INC., or the GOOGLE APPS MARKETPLACE™ online application service provided by GOOGLE INC., or the like).

In some embodiments, listing of a particular editing app (e.g., app **512**) in "linked" section **504** indicates that the user has explicitly established an association between the editing app and the user's account with online content management service **100**, e.g., as described above with reference to FIG. **1**. A client app (or other program) that generates app chooser interface **502** can identify linked editing apps for a particular type of content item, e.g., based on link information **160** maintained by online content management service **100**. If no editing apps for the particular type of content item are linked, section **504** can be omitted or empty.

In some embodiments, listing of a particular editing app (e.g., app **514**) in "installed" section **506** indicates that the editing app is installed on the client device but has not been linked to the user's account with online content management service **100**. If no apps are known to be installed but unlinked, section **506** can be omitted or empty. In some embodiments, a client app (or other program) that generates app chooser interface **502** may not have access to information about apps that are installed and not linked, and section **506** can be omitted.

In some embodiments, listing of a particular editing app (e.g., app **516**) in "recommended" section **508** indicates that the editing app is not linked (and/or not installed) but is recommended by the provider of online content management service **100** for editing content items of the particular type. Recommendations can be based on various criteria, such as: input from an editorial team that tests various editing apps to determine which ones to recommend; crowdsourcing data (e.g., aggregate user ratings for various apps, aggregate patterns of user behavior such as which editing apps are most often used for particular types of content items); the user's own behavior (e.g., which editing apps the user has used on other platforms or for other content items of this type or for this content item); and/or behavior of other users who share access to the content item in question. A combination of any of these and/or other criteria can be used to determine which editing apps to recommend and in what order to display recommended editing apps.

It is to be understood that app chooser interface **502** can be varied. For example, an app chooser interface can include all, some or none of the groups shown in FIG. **5** and/or other groups as desired. Different groupings might or might not be defined to be mutually exclusive; in some embodiments the same app can appear in multiple groups. In some embodiments, each group can be presented as a collapsible element, and the element can be initially displayed in either an expanded or collapsed state. For example, if linked group **504** contains one or more apps, other groups can initially be displayed in a collapsed state. Any groups that do not contain at least one app can be rendered to indicate that they are empty (e.g., grayed out) or omitted entirely. An app chooser interface can represent apps using icons, names, both icons and names, and/or any other indicia as desired.

In some embodiments, default choices can be defined. For example, if a user has previously edited a given content item (or another content item of the same type) using a particular editing app, that editing app can be used as the default selection. In some embodiments, the default choice can be highlighted when app chooser interface **502** appears, or the default choice (if any) can be shown in a separate section at the top and identified as the default.

A user can operate app chooser interface **502** to select the editing app to be used, e.g., by selecting the desired app using a pointing device or touchscreen. In some embodiments, if the user selects an app that is installed but not linked, the user can be prompted to link the app to the user's account on the online content management service. In some embodiments, if the user selects an app that is not installed, the user can be prompted to install the app (which can include, e.g., purchasing and/or downloading the app from an online app source).

Once the user has selected an editing app, the content item can be opened for editing in the editing app. FIGS. **6**A and **6**B illustrate editing interfaces according to various embodiments of the present invention. In FIG. **6**A, editing interface **600** can be similar or identical to the normal interface of the editing app. For example, the name of the content item being edited can be displayed in a title area **602**; the item itself (or a portion thereof) can be displayed in editing region **604**, and various controls **606** can be provided for invoking functions of the editing app. It is to be understood that the particular configuration of interface **600** including the size, number, content, and position of various GUI elements, can be determined as desired by the provider of the editing app and need not be affected by whether the content item being edited is sourced from online content management service **100** or some other source.

Save control **610** and done control **612** can be operated by the user to indicate that the content item should be saved and/or that the editing session should end (which can include, e.g., closing the content item and/or exiting the editing app). In instances where the content item is sourced from online content management service **100**, saving the item or ending the editing session can result in the content item being stored back to content management service **100**, without the need for the user to expressly direct the process.

FIG. **6**B shows an editing interface **650** in which interface **600** of the editing app can be embedded within an interface **660** of a client app (e.g., client app **132**). Thus, the editing app interface can be opened in a separate window or in a window embedded within the client app's interface. Whether to embed the editing app's interface or use a separate window can be a matter of design choice and can depend in part on considerations such as screen size and/or esthetic preferences of the client and/or editing app providers.

When the user ends the editing session, e.g., by operating done control **612**, control can return to client app **132**. FIG. **7** shows an interface **700** that can appear when control is returned to the client app according to an embodiment of the present invention. Interface **700** can be generally similar to

interface **300** of FIG. **3**. In some embodiments, an alert **702** can be displayed to indicate to the user that the edited content item is now present. While alert **702** is depicted as a text box overlay, other forms of user alerts can be used, e.g., a message in a dedicated message area, a format change in the list entry for the modified item (e.g., change foreground and/or background color), an icon next to the list entry for the modified item, and so on. In some embodiments, an alert need not be shown; for example, the user can confirm the update by seeing that the modification date has changed. In some embodiments, a notification that the item was modified may be sent by online content management service **100** to other devices associated with the user (e.g., any of devices **112**, **114**, **116** of FIG. **1**), and alerts may appear on any or all of the user's client devices. In some embodiments, a notification to a particular user device can trigger the device to perform other operations, such as synchronizing a locally cached copy of the content item in question.

From the user's perspective, the interfaces of FIGS. **3-7** (or other interfaces with similar features) can provide a "seamless" workflow similar to working with locally stored content items. For example, a user can browse content items in the interface of FIG. **3** and select a content item to edit, with the item appearing in an editing interface as shown in FIGS. **6**A-**6**B and being saved back to the location from which it was selected; the user is not required to take extra actions related to moving the content item between a working storage location accessible to the editing app (e.g., local storage on the user device) and a persistent storage location at online content management service **100**.

In some embodiments, this seamless experience can be facilitated by interactions between the client app and the editing app that can be transparent to the user. FIG. **8** shows a flow diagram of a process **800** for launching an editing app to edit a content item stored on online content management service **100** according to an embodiment of the present invention. Process **800** can be executed, e.g., by a client app (such as any of apps **132**, **136**, **144** of FIG. **1**).

At block **802**, a client app (e.g., app **132**) can present a representation of one or more content items to the user in an interface, along with a control operable by the user to indicate a desire to edit the item. In some embodiments, the representation can include the name of the content item (e.g., as shown in the listing in FIG. **3**). The representation can also include other information, such as content type identification, an icon or thumbnail image representing the item, or a preview of some or all of the item's content (e.g., as shown in FIG. **4**). The representation can be presented in an interface that includes a user-operable edit control (e.g., edit button **316** or edit button **414**). The interface can also include other controls, and the user may operate such controls, e.g., to view a different list of content items or to preview a different portion of the content item.

At block **804**, the user can operate the edit control to indicate a desire to edit a particular content item. For example, the user can click on or touch edit button **316** of FIG. **3** or edit button **414** of FIG. **4**.

At block **806**, the user can select an editing app to be used for editing the content item. In some embodiments, client app **132** can present app chooser interface **502** of FIG. **5**, and an example of a process of selecting an editing app via an interface of this kind is described below with reference to FIG. **9**. Other interfaces can also be used. For instance, in some embodiments, the user can be presented with a list of all apps available on the client device and can select from the list.

At block **808**, client app **132** can transfer control to the editing app. Any technique by which a first application executing on a particular user device can transfer control to a second application to execute on the same device can be used; in some instances, transferring control may include instructing the user device to launch the editing app.

For example, in the context of computer **112** of FIG. **1**, if client app **132** executes within browser **122**, client app **132** can redirect browser **122** to an editing app (e.g., app **128**) by providing a uniform resource locator (URL) for the editing app; standard URL syntax may be used. It should be noted that the editing app can be stored locally or remotely, as a URL can point to either type of resource. To allow the editing app to obtain the file, the client app can append a resource handler to the URL of the editing app. For example, the URL can have the format:

```
prot://editingapp.location/ocms_edit?userID-
    uuu&itemID=nnn
```

where "prot://" indicates a transfer protocol to use, "editingapp.location/" indicates the location where the editing app resides (which can be local, e.g., if "file://" is used as the "prot://" identifier). The remainder of the URL constitutes a resource handler that is to be provided to and interpreted by the editing app. For instance, "ocms_edit" can indicate that the editing app was invoked to edit an online content item by a client app associated with online content management service **100**, and "userID" and "itemID" can provide strings that the editing app can use to retrieve the content item from online content management service **100**. Any editing app that can be invoked using a URL can be programmed to interpret a resource handler of this kind and use the information to retrieve the content item. Other formats can also be used.

In other embodiments, a client app executing on a given client device can transfer control to an editing app on the same device by providing a suitably formatted command string to the operating system of the client device. The command string can include parameters (e.g., a userID and an itemID) that can be delivered to the editing app, and the editing app can use these parameters to retrieve the content item from online content management service **100**.

In still other embodiments, the client app may have a cached copy of the content item stored on the client device. If the operating system supports data transfer between apps, the client app can transfer the cached copy to the editing app. Other techniques can also be used, depending on how a particular platform implements allowing an executing app to invoke another app.

Once control is transferred to the editing app, process **800** can end. In some instances, the client app can continue executing, e.g., as a background process, while the user edits the document using the editing app. An example editing process is described below with reference to FIG. **10**.

As described above, at block **806** of process **800**, the user can select an editing app, e.g., using app chooser interface **502** of FIG. **5**. FIG. **9** shows a flow diagram of a process **900** for selecting an editing app according to an embodiment of the present invention. Process **900** can be implemented in a client app (e.g., app **132** of FIG. **1**) and can be executed, e.g., as all or part of block **806** of process **800**.

Process **900** can begin when the user has indicated a desire to edit a particular content item. At block **902**, the client app can present a menu of available apps. In some embodiments, the menu can be presented as app chooser interface **502** of FIG. **5**; other formats and interfaces can also be used. At block **904**, the user can select one of the apps from the menu as the editing app to be used.

In some embodiments, an editing app that is presented in the menu might or might not already be installed on the client device. For instance, as described above with reference to

FIG. **5**, the menu can include a group **508** of recommended apps that might not be currently installed. At block **906**, if the selected editing app is not installed, then at block **908**, process **900** can invoke an app installer to install the app. In some instances, block **908** may include acquiring the app from an online app source (including purchasing, downloading, and/or installing the app). When the app installer returns control to process **900**, at block **912**, process **900** can determine whether the app was successfully installed. If not, then at block **914** process **900** can generate an error message to the user. After displaying the error message, process **900** can return to block **902** to allow the user to make another selection. In some embodiments, process **900** can provide other options, such as retrying the installation or cancelling the edit operation.

At block **920**, if the editing app was previously installed (block **906**) or was successfully installed (block **912**), process **900** can determine whether the editing app is linked to the user's account on online content management service **100**. In some embodiments, process **900** can determine whether the editing app is linked based on link information **160** as described above. In some embodiments, process **900** can determine whether the editing app is linked by querying the editing app using any app-to-app communication mechanism supported by the platform on which the client app is executing. In some embodiments, process **900** can determine whether the editing app is linked by querying a table of linked apps maintained locally on the client device.

If the editing app is not linked, then at block **922**, process **900** can prompt the user to link the editing app to the user's account at the online content management service. For example, the user can be prompted to enter account credentials (e.g., user ID and password) associated with her account, and process **900** can verify the credentials, e.g., by communicating with online content management service **100** or by referencing a copy of the credentials stored in association with the client app. In some embodiments, process **900** can communicate with online content management service **100** to update the user's account record **152** to add the newly-linked app to link information **160**. In some embodiments, process **900** can communicate with the editing app to establish the link (e.g., updating state information maintained by the editing app). In some embodiments, process **900** can update a table of linked apps maintained locally on the client device to indicate that the editing app is now linked.

In some embodiments, the client app may allow only editing apps that are linked to edit content items that are stored on the online content management service. Accordingly, at block **924**, if the user declines to link the app, or if the attempt to link fails, process **900** can generate an error message to the user at block **926**. After displaying the error message, process **900** can return to block **902** to allow the user to make another selection. In some embodiments, process **900** can provide other options, such as retrying the linking or cancelling the edit operation.

In some embodiments, linking the editing app to the online content management system can be optional. For example, the client app (and online content management service **100**) can treat the fact that the user selected a particular editing app for use with a particular content item as an implicit authorization to allow access to that item by the selected editing app. In some embodiments, an editing app that is not linked may be allowed to access only content items that the user has expressly chosen to edit with that app. In some embodiments, the client app may establish a link to the editing app automatically when the user selects the editing app at block **904**, and prompting the user to establish a link at block **922** can be omitted (or the prompt can be a simple "OK" without requiring the user to enter account credentials).

At block **930**, once the selected editing app is installed and linked (or otherwise authorized), process **900** can transfer control to the editing app. In some embodiments, block **930** can be similar or identical to block **808** of process **800** described above.

It will be appreciated that the app chooser process of FIG. **9** is illustrative and that variations and modifications are possible. Steps described as sequential may be executed in parallel, order of steps may be varied, and steps may be modified, combined, added or omitted. For instance, integrating installation and linking of editing apps into the app chooser process can be convenient for the user but is not required.

In some embodiments, the app chooser may offer the option to search for additional apps (e.g., by accessing an online app source); this can be implemented, e.g., using more button **510** of FIG. **5**. If the user selects this option rather than selecting one of the linked, installed, or recommended apps, the client app can transfer control to a program that accesses the online app source. Once the user has obtained and installed an app from the app service, control can be transferred back to the client app. At that point, the client app can continue process **900**, e.g., by presenting an updated menu at block **902** that includes the newly installed app. The newly installed app can be highlighted or set as a default choice if desired.

Processes **800** and **900** can end when the client app transfers control to the selected editing app. In some embodiments the client app can continue to execute, e.g., as a background process after transferring control. In some embodiments, the client app can exit; state information can be stored to allow the client app to resume execution where it left off.

FIG. **10** shows a flow diagram of a process **1000** for editing a content item that is stored at an online content management service according to an embodiment of the present invention. Process **1000** can be implemented, e.g., in an editing app for content items of a particular type, such as any of apps **124**, **126**, **128**, **136**, **138**, **144**, **146**.

Process **1000** begins at block **1002** when the client app transfers control to the editing app (e.g., from process **800** or **900**). At block **1004**, the editing app reads the item-identifying information provided by the client app. For example, the editing app can parse the URL resource handler described above to determine that online content management service **100** is the host for the content item and to extract item-identifying information (e.g., user ID and item ID). At block **1006**, the editing app can request the content item from online content management service **100** using the item-identifying information. At block **1008**, the editing app can receive a copy of the requested content item, e.g., in working memory or other local storage.

At block **1010**, the editing app can present the content item in its editing interface, e.g., interface **600** shown in FIG. **6**. At block **1012**, the user can edit the document by interacting with the editing interface. Depending on the particular editing app and type of content item, a wide range of editing operations can be supported, including but not limited to: adding, deleting, or modifying text; changing colors, formats, sizes, and other properties of graphical objects or pixels; modifying audio content; changing metadata; encrypting and/or decrypting content; adding or changing a digital signature; and so on.

At block **1014**, the editing app can determine whether the content item should be saved. In some embodiments, a content item can be saved in response to user input (e.g., selecting save button **610** or done button **612** of FIG. **6**). In some

embodiments, the editing app may automatically save the content item at regular intervals. If block **1014** results in a determination that the content item should be saved, then at block **1016**, the editing app can save the content item to the online content management service. For example, the editing app can send a modify instruction to the online content management service; the modify instruction can include the item-identifying information from block **1004** and the modified content. Other communication protocols and techniques can be used. In some embodiments, the editing app can send a complete version of the content item that replaces the previous version on content management service **100**. In some embodiments, the editing app can send data corresponding to modified sections of the content item rather than the whole item (e.g., if metadata is to be modified), and the online content management service can update the item accordingly. Other techniques can also be used.

At **1018**, the editing app can determine whether the editing operation is done. For example, the editing app can detect user operation of done button **612** of FIG. **6**. If the operation is not done, process **1000** can return to block **1012** for further editing.

Once the editing operation is done at block **1018**, then at block **1020**, the editing app can return control to the client app. On returning control, the editing app can provide information to the client app confirming that the editing occurred. For example, in some embodiments, the editing app can transfer control by providing a URL for the client app; standard URL syntax may be used. In some embodiments, the URL can include a resource handler indicating that the editing operation is done and including item-identifying information for the content item that was edited. For example, the URL can have the format:

prot://clientapp.location/
ocms_edit_done?userID=uuu&itemID=nnn&editapp=ppp

where "clientapp.location" is the location of the client app, and the resource handler identifies the item that was edited and the app that was used for editing. Other formats can also be used.

In other embodiments, an editing app executing on a given client device can transfer control to an online content client app on the same device by providing a suitably formatted command string to the operating system of the client device. The command string can include parameters (e.g., a userID, an itemID, an app ID) that can be delivered to the client app to identify the editing app and the edited content item.

In still other embodiments, if the operating system supports data transfer between applications, the editing app can transfer its copy of the edited content item to the client app, and the client app can, in turn, synchronize the edited content item to the online content management service. Other techniques can also be used, depending on how a particular platform implements allowing an executing app to invoke another app.

When control is returned to the online content client app, process **1000** can end. In some embodiments, the editing app can exit; in other embodiments, the editing app can continue to execute as a background process. In the latter case, the editing app can close the content item (e.g., delete it from its working memory or change the interface state such that the content item no longer appears as an editable item).

When control is returned to the online content client app, the client app can generate an alert indicating that the edit occurred, e.g., as shown in FIG. **7**. This alert can be based on information provided by the editing app and/or information received from the online content management service alerting the client app to the update.

It will be appreciated that the editing workflow and processes of FIGS. **3-10** are illustrative and that variations and modifications are possible. Steps described as sequential may be executed in parallel, order of steps may be varied, and steps may be modified, combined, added or omitted. For instance, computing platforms may vary in regard to communication between applications, and the specific mechanisms by which a client app invokes an editing app and by which the editing app returns control to the client app can be optimized for a specific platform. The selection of an editing app can involve more or fewer options, or different options, than those described herein, and the number of available editing apps may depend on the content type, platform, and/or which apps are installed on a particular user device.

As noted above, the term "editing" can encompass a wide variety of operations on a content item, and these operations might or might not modify the item's content and/or metadata. In addition to or instead of editing, other operations on content items can be supported using the processes described above or similar processes.

One example is ordering prints of a content item such as a photo. Various apps (e.g., photo ordering app **140** of FIG. **1**) can allow a user to select a photo and identify an article on which the photo should be printed. For example, the user may be able to order prints on photo-quality paper, T-shirts, banners, coffee mugs, or the like. An ordering app may allow the user to select a location for picking up the printed articles or to request delivery of the articles. An ordering app can provide various other features such as an interface for locating stores that can make prints, pricing information, and interfaces for specifying print options such as size and quantity.

Some embodiments of the present invention can allow a user to order prints made from one or more selected content items using an ordering app (e.g., photo ordering app **140**). For example, FIG. **11** shows an interface **1100** according to an embodiment of the invention. Interface **1100** can be implemented, e.g., as a photo-preview interface for a client app such as client app **136** of FIG. **1**. Interface **1100** can allow the user to select apps for ordering articles or modifying an image.

Interface **1100** can include a display area **1102** to display an image (e.g., a photo) stored on online content management service **100**. Interface **1100** can include various image manipulation controls, such as zoom controls **1104** that allow the user to change the size of the displayed image and/or navigation controls **1106** that allow the user to view different images from a group (e.g., different images in the same folder).

In some embodiments, interface **1100** can also include controls that allow the user to invoke apps to interact with the displayed content item. For example, edit button **1108** can be used to invoke a photo editor to edit the image. If the user selects edit button **1108**, a menu of photo editing apps can be presented; this can be similar to app chooser interface **502** of FIG. **5**, although the selection of apps presented can be different (e.g., apps for editing photos rather than apps for editing text). The workflow can be generally similar to that described above, and similar processes can be used in the client app and the editing app to implement the workflow.

As another example, "order" button **1110** can be used to invoke an ordering app to order articles printed with the image. If the user selects order button **1110**, a menu of ordering apps can be presented; this can be similar to app chooser interface **502** of FIG. **5**, although the selection of apps presented can be different. In general, the workflow can be similar to that described above, and similar processes can be used in the client app and the ordering app (acting analogously to

an editing app, although some ordering apps might not modify the content items) to implement the workflow.

It should be noted that, in relation to the workflows and processes described herein, the distinction between an "editing" app and an "ordering" app is artificial. Either class of app can be invoked from a client app and provided with a reference to a specific online content item on which it is to operate. Either class of app can present the content item to the user, perform any operations it supports on or with the content item, and (if any changes are made) save the content item back to the online content management system, then return control to the client app. Thus, an editing app or an ordering app can be understood as examples within a broader class of "operating" apps that perform operations on content items.

Although the workflows can be the same, presenting the user with separate controls for different classes of operations (e.g., edit button **1108** and order button **1110**) can be a user-friendly design choice. For example, ordering apps may provide little or no editing capability, and editing apps may provide little or no capability for ordering articles made from the content item. If the user can indicate a desired intent (e.g., by selecting either edit or order), the menu of operating apps presented to the user can be tailored to that intent (e.g., by presenting only editing apps if the user indicates intent to edit or only ordering apps if the user indicates intent to place an order).

In some instances, presenting separate controls for different classes of operations can facilitate partnering between a provider of the online content management service and providers of other services. For example, in some embodiments order button **1110** can automatically launch an ordering app associated with a preferred service provider, rather than first presenting an app chooser. In some embodiments, the user can be given the option to use the preferred provider's app or select another app. Where separate controls are provided for different classes of operations, the provider of the online content management service can partner with different preferred providers for different classes of operations.

Options for different classes of operations can be provided, e.g., by providing a separate user-operable control for each class (e.g., as shown in FIG. **11**), or by providing a generic "open with . . . " control. In some embodiments, a generic control can launch a menu of all available apps, e.g., grouped according to supported class(es) of operations, such as editing, ordering, or digitally signing. In other embodiments, a generic control can open a dialog box where the user can select one or more classes of operations to be performed, and an app chooser menu can be generated based on the user's selection.

In some embodiments, an operating app can be invoked to operate on a group of online content items. For example, a user may wish to order a set of prints of all photos (or other images) from a particular folder on online content management service **100**. FIG. **12** shows an interface **1200** for viewing multiple photos (or other images) according to an embodiment of the present invention. Interface **1200** includes a label area **1202**, e.g., identifying a folder that contains photos and a grid area **1204** where the photos can be displayed (sometimes although not necessarily at reduced size). The grid can be regular or irregular, depending on the sizes of different photos. In some embodiments, a user can click on or touch a photo in grid area **1204** to bring up a larger view (e.g., similar to interface **1100** of FIG. **11**).

Interface **1200** can include an order button **1206** that can invoke a menu of ordering apps, e.g., as described above with reference to FIG. **11**. (In some instances, the order button can directly invoke a preferred ordering app.) In some embodiments, ordering apps invoked via button **1206** can be limited to apps that are capable of operating on a folder as a content item. For example, an ordering app may be able to receive a reference to a folder containing image files and can allow the user to order one or more sets of prints of all images in the folder.

As the foregoing examples illustrate, an online content client app can invoke a variety of operating apps to perform various operations on a content item (or in some instances sets of content items) stored in the online content management service. Examples of operations include editing or otherwise modifying a content item, printing a content item, placing orders (e.g., for merchandise) related to a content item, digitally signing a content item, encrypting or decrypting a content item, converting a content item to a different format, sending a content item to a destination (e.g., using an email or messaging app), and so on. A given instance of a given operation might or might not actually modify the content or metadata of the item on which the operation is performed.

In embodiments described above, an operating workflow begins from within a client app (e.g., any of apps **132**, **136**, **144** of FIG. **1**). However, this is not required; in some embodiments an operating workflow can begin from within an operating app, such as an editing app.

For example, FIG. **13** shows an interface **1300** for an editing app according to an embodiment of the present invention. Interface **1300** can be generally similar to interface **600** of FIG. **6**A, except that in this example, no content item is currently opened for editing. Accordingly, editing region **1302** can be grayed out. Some or all of editing controls **1304** can also be rendered in a manner that indicates that they are inactive (e.g., grayed out or hidden). An open button **1306** can be provided to allow a user to select a content item to be opened for editing in the editing app.

In some embodiments, when the user operates open button **1306**, a file selection dialog box **1402** can be opened, e.g., as shown in interface **1400** of FIG. **14**. File selection dialog box **1402** can list files **1404** that are available on the client device; the files can be presented as selectable objects, and the user can select one, e.g., by double-clicking on its name or by selecting the name and then operating "OK" button **1406**. Cancel button **1408** can be operated to close choose file dialog box **1402** without selecting a content item, in which case interface **1400** can revert to interface **1300**.

Dialog box **1402** can include a control **1410** operable to select a file from the online content management service. In some embodiments, control **1410** is displayed only if the editing app is linked to a user's account on online content management service **100**. In some embodiments, if the editing app is not linked when a user selects control **1410**, the editing app can generate a prompt to the user to link the app (e.g., prompting the user to enter account credentials).

When the user operates control **1410**, a content-item chooser can be launched. FIG. **15** shows a content item chooser interface **1502** displayed as an overlay on editing app interface **1500** according to an embodiment of the present invention. Editing app interface **1500** can be similar to interface **1300**. Content item chooser interface **1502** can present a list **1504** of content items associated with the user's account on online content management service **100**. The list can be filtered based on the file type (or types) that are known to be editable by the editing app. In some embodiments, the list can also include folders (e.g., at **1506**), and the user can select a folder to view a list of content items contained therein. Accordingly, the user can operate content item chooser **1502** to select a content item to be edited. OK button **1508** and cancel button **1510** can operate similarly to OK button **1406**

and cancel button **1408** of FIG. **14**. When a content item is selected, the content item can be opened in the editing app; the resulting interface can be similar to that shown in FIG. **6**.

In some embodiments, chooser interface **1502** can be provided and managed by online content management service **100**. For example, online content management service **100** can provide a chooser API that can be called by the editing app to launch chooser interface **1502**. The API call can allow the editing app to specify information such as which file types are of interest and an identifier of the user for whom the chooser is being presented. In some embodiments, the chooser API controls the rendering of chooser **1502** and interpretation of user input. When a content item is selected, the chooser API can return item-identifying information to the editing app, which can then request the item from online content management service **100**.

FIG. **16** shows a flow diagram of a process **1600** for opening a content item in an editing app according to an embodiment of the present invention. Process **1600** can be implemented in an editing app or other operating app.

At block **1602**, the editing app can display a control operable to open a content item from an online content management service (e.g., control **1410** of FIG. **14**). When the user operates this control (block **1604**), the editing app can call a chooser API provided by the provider of online content management service **100** (block **1606**). At block **1608**, the user can interact with a chooser interface (e.g., chooser interface **1502** of FIG. **15**) to select a content item from the online content management service. As noted above, chooser interface **1502** can be managed through the chooser API. In some embodiments, the chooser API can include code that renders chooser interface **1502** and code that interprets user input data when the user interacts with chooser interface **1502**. In some embodiments, the chooser API can return information to the editing app that the app can use to render chooser interface **1502** and interpret the user input.

Once the user has selected a content item at block **1608**, the editing app can receive item-identifying information via the chooser API at block **1610**. At block **1612**, the editing app can communicate with the online content management service using the item-identifying information to request the item. This can be similar or identical to block **1006** of process **1000** of FIG. **10**, and once the item is requested, the editing app can proceed using the rest of process **1000** or similar processes. Thus, the user can edit the content item and save the edited item back to the online content management service (e.g., replacing the item that was retrieved for editing).

It will be appreciated that the file-opening process and interfaces of FIGS. **14-16** are illustrative and that variations and modifications are possible. Steps described as sequential may be executed in parallel, order of steps may be varied, and steps may be modified, combined, added or omitted. For instance, the item-chooser interface can be different from the example shown, and the division of activity between the chooser API and the editing app can be varied.

It should be noted that some editing apps may allow multiple content items to be open concurrently. For example, an open control such as button **1306** of FIG. **13** can be presented to the user while one (or more) content items is already open, allowing the user to open another content item. Each open content item can be independently edited, saved, and closed. Content items that are stored on online content management service **100** can be edited and saved using process **1000** or similar processes. In some embodiments, local and online content items can be concurrently open in an editing app.

In addition to modifying or operating on existing content items, a user may want to create a new content item to be stored on online content management system **100**. In some embodiments, this can be done using an online content client app interacting with an editing app (or other operating app).

For example, FIG. **17** shows a user interface **1700** for a client app (e.g., client app **132** of FIG. **1**) according to an embodiment of the present invention. Interface **1700** can be generally similar to interface **300** of FIG. **3**. Interface **1700** can include a control **1702** that is operable to initiate a process for creating a new file.

User operation of control **1702** can result in displaying an app chooser, allowing the user to select an operating app with which the new file should be created. Any app capable of creating a new file can be used. FIG. **18** shows an app chooser interface **1802** according to an embodiment of the present invention. In this embodiment, app chooser interface **1802** appears as an overlay on interface **1700** when a user operates control **1702**.

App chooser interface **1802** can be similar to app chooser **502** of FIG. **5**, with apps grouped based on whether they are linked (group **1804**), installed (group **1806**), or recommended (group **1808**). In the case of creating a new item, however, the content type of the new item might not be known, and interface **1802** can present all apps without regard for content types. In some embodiments, app chooser interface **1802** can include a file type selection dialog **1810**. The user can select a file type, e.g., by checking one of boxes **1812**, and the app chooser can automatically filter the list of apps based on the selected file type. For example, if the user selects "Text," the list of apps can be reduced to show only apps capable of creating a text file. In some embodiments, the user can select multiple file types at once, and apps capable of creating any one (or more) of the selected file types can be listed. Some embodiments may provide other options for locating and selecting an operating app, such as searching for apps by name, tags, or descriptions; viewing an alphabetical list of all installed apps; or the like. Some embodiments can allow the user to access an online app source to find and download an app (e.g., via control **1814**); this option can be similar to options described above with reference to FIGS. **5** and **9**.

A cancel button **1816** can allow the user to cancel the new-item operation and return to interface **1700**.

If the user selects an app using interface **1802**, a file naming interface can be displayed. FIG. **19** shows an example of a file naming interface **1900** according to an embodiment of the present invention. In some embodiments, naming interface **1900** can appear as an overlay on interface **1700** of FIG. **17**, e.g., replacing interface **1802**. (There can be an animated transition, such as rotate or wipe, from interface **1802** to interface **1900**.)

Naming interface **1900** can present a path to the new file, e.g., in area **1902**. The path can be defined within the user's folder hierarchy on online content management service **100**. In some embodiments, the path can default to the user's home folder, or to the folder from which the user invoked the new file creation. Naming interface **1900** can allow the user to change the path, e.g., by browsing and selecting a folder from navigation area **1904**.

Naming interface **1900** can include visual indicia to remind the user of the file type **1906** and selected app **1908**. A back button **1910** can allow the user to return to app chooser interface **1802** to select a different app.

Region **1912** can display a list of content items in the currently selected folder. In some embodiments, the content items can be filtered based on file type, e.g., showing only items that match selected file type **1906**. In some embodiments, any folders within the currently selected folder are also displayed in region **1912**, and this can facilitate changing

the path by navigating down the hierarchy. Other navigation controls (not shown) can also be provided to assist the user in identifying the path to the new content item. In some embodiments, interface **1902** may allow the user to create a new folder within the currently selected folder.

Text box **1914** can be provided to allow the user to enter a name for the new file. In some embodiments, a file type extension (e.g., ".pdf") can be automatically appended to the name and/or a default new file name can be automatically populated in box **1914**. The user can enter a desired name or overwrite the default name. OK button **1916** can be operated to instruct the client app to proceed with creating the file using the current path and file name; cancel button **1918** can be operated to cancel the file creation operation and return to interface **1700**.

When the user operates OK button **1916** (or otherwise indicates that the item name and path have been selected), the client app can send an instruction to online content management service **100** to create the new file, then transfer control to the editing app to allow the user to work with the new file. Editing app can launch with an interface similar to that of FIG. **6**A or **6**B; since the content item is new, editing area **604** can be initially empty or filled with a default new item as defined by the app.

FIG. **20** is a flow diagram of a process **2000** for creating a new document according to an embodiment of the present invention. Process **2000**, can be implemented, e.g., in client app **132**, **136**, **144** of FIG. **1**.

At block **2002**, the client app can display a user interface that includes a "create" button, e.g., interface **1700** of FIG. **17**, and at block **2004**, the client app can detect that the user has selected the create button.

At block **2006**, the client app can display an app chooser interface that allows the user to select an editing app to create the new content item. For example, app chooser interface **1802** of FIG. **18** can be presented. At block **2008**, the client app can receive a user selection of an editing app via the app chooser interface. Operation of app chooser interface **1802** can use processes similar to process **900** of FIG. **9** and can include installing and/or linking an app if appropriate.

At block **2010**, the client app can display a file naming interface that allows the user to select a name and path (or storage location) for the new content item. For example, interface **1900** of FIG. **19** can be used. At block **2012**, the client app can receive the user's selection of a name and path.

At block **2014**, the client app can instruct online content management service **100** to create a new content item using the selected name and path. Online client content management service **100** can, for instance, create an empty file that is associated with the name and path and assign an item identifier to it. Online content management service **100** can return the newly assigned item identifier to client app.

At block **2016**, the client app can transfer control to the editing app. This can be generally similar to block **808** of process **800**, and the client app can provide the item-identifying information to the editing app. In this instance, however, the client app can indicate that the editing app should create a new document rather than retrieving an existing document. For example, where URL resource handlers are used, a resource handler indicative of editing an existing content item (e.g., "ocms_edit" as described above) can be replaced with a different resource handler indicative of creating a new item (e.g., "ocms_new"). In some embodiments, e.g., where the editing app supports multiple file types, the resource handler can also indicate the selected file type of the new item. The client app can supply the item-identifying information for the new content item, and the editing app can use this information to save the new item to online content management service **100**.

After transferring control at block **2016**, process **2000** can end. In some embodiments, the client app can continue executing, e.g., as a background process, while the user edits the document using the editing app. Editing of the content item can proceed similarly to process **1000** of FIG. **10**, with the content item being saved to online content management service **100** using the item-identifying information provided at block **2016**. When editing is complete, control can be returned to the online content client app, e.g., as described above.

It will be appreciated that the document process described herein is illustrative and that variations and modifications are possible. Steps described as sequential may be executed in parallel, order of steps may be varied, and steps may be modified, combined, added or omitted. For instance, in some embodiments, invoking a "new" operation can simply open a new content item in an editing app without first prompting for a name and path, and the user can be prompted to provide a name and path for the new item at a later point, e.g., after adding content to the item and invoking a "save" operation in the editing app.

In some embodiments, new files to be stored on online content management service **100** can be created from within an editing app. FIG. **21** shows a user interface **2100** for an editing app that supports file creation according to an embodiment of the present invention. Interface **2100** can be generally similar to interface **1300** of FIG. **13**.

Interface **2100** can include a new button **2102** that is operable to create a new content item to be stored locally or on online content management service **100**. For example, as shown in FIG. **22**, in some embodiments, selecting new button **2102** can result in the editing app displaying a menu **2202** from which the user can indicate whether the new file should be opened locally or on online content management service **100**. Selecting "local" can result in creation of a new local file; this process is not described further.

Selecting "OCMS" can result in the editing app invoking a file namer interface **2300** as shown in FIG. **23**. File namer interface **2300** can be similar or identical to file namer interface **1900** of FIG. **19**. In some embodiments, file namer interface **2300** is implemented by the provider of online content management service **100**, and the editing app can invoke a corresponding file namer API provided by the online content provider to generate and manage user interaction with file namer interface **2300**. The file namer API can control the rendering of file namer interface **2300** of FIG. **23** and interpretation of user input. The file namer API can also manage communication with online content management service **100** to obtain item-identifying information for the new content item. When the new content item is defined, the file namer API can return item-identifying information to the editing app, which can then request the item from online content management service **100**.

FIG. **24** is a flow diagram of a process **2400** for creating a content item within an editing app according to an embodiment of the present invention. Process **2400** can be implemented in any editing app (e.g., any of apps **124**, **126**, **128**, **136**, **138**, **146** of FIG. **1**).

At block **2402**, the editing app can present a user interface that includes an option to create a document on online content management service **100** (e.g., menu **2202** of FIG. **22**). At block **2404**, the user can select this option. In response, at block **2406**, the editing app can invoke a file namer API provided by the provider of online content management ser-

vice **100**. In some embodiments, the file namer API can include code that renders file namer interface **2300** and code that interprets user input data when the user interacts with file namer interface **2300**. In some embodiments, the file namer API can return information to the editing app that the app can use to render file namer interface **2300** and interpret user input.

At block **2408**, the user can define the new content item using file namer interface **2300**. When the user has defined the new content item, the file namer API can communicate with online content management service **100** to receive item-identifying information and can provide that information to the editing app at block **2410**.

At block **2412**, the editing app can display an editing interface for a new content item. Thereafter, the user can edit the content using the editing app. Editing of the content item can proceed similarly to process **1000** of FIG. **10**, with the content item being saved to online content management service **100** using the item-identifying information provided at block **2410**.

Certain embodiments can leverage the file-creation functionality to allow an existing content item to be saved to the online content management service at a new location from within an editing app, thus providing a "save as" option. For example, a user can open a locally-stored content item in an editing app, then save the content item as a new item on online content management service **100**. As another example, a user can open a content item from online content management service in an editing app (e.g., using processes described above), then save the content item to a different location on online content management service **100**, also from within the editing app.

FIG. **25** shows an interface **2500** for an editing app with a "save as" option according to an embodiment of the present invention. Interface **2500** can be generally similar to other editing interfaces described above (e.g., interface **600** of FIG. **6**). In this example, interface **2500** can include a "save as" button **2502** that the user has selected. Selecting save-as button **2502** can result in editing app displaying menu **2504**, allowing the user to select whether to save locally or to online content management service **100**. In some embodiments, both options can be made available regardless of the current storage location of the content item. Thus, a locally stored item can be saved as an online item, an online item can be saved as a local item, or an online item can be saved as a different online item.

If the user selects the option in menu **2504** to save to the online content management system, the editing app can invoke a file namer interface. This interface can be similar or identical to file namer interface **2300** of FIG. **23**, allowing the user to designate a "target" name and path for saving the item. In some embodiments, if the content item is currently stored on online content management system **100**, the path can default to the current location where the content item is stored. Further, the file name field in file namer interface **2300** can default to a name derived from the current name of the item, such as "Copy of currentname" or "currentname (2)," where "currentname" is the current name of the content item.

A "save as" operation can be performed without overwriting or deleting the source content item; in effect, a new item is saved to the target path and file name specified by the user, and the source and new items can co-exist as different items in the same system or on different systems. In some embodiments, if the user selects the folder path and item name of the source item (or the path and name of any existing content item) as the new path and name, a warning message can be generated and the user can be prompted to confirm that the existing item should be replaced.

FIG. **26** shows a flow diagram of a process **2600** for implementing a save-as operation according to an embodiment of the present invention. Process **2600** can be implemented, e.g., in any editing app.

At block **2602**, the editing app can present an interface option allowing the user to perform a save-as operation to save the content item to online content management service **100**, e.g., menu **2504** of FIG. **25**. At block **2604**, the user can select this option.

At block **2606**, the editing app can determine whether the content item is currently stored on online content management service **100** or elsewhere. If the content item is currently stored on online content management service **100**, the editing app can invoke the file namer API and provide the current item-identifying information at block **2608**. The same file namer API can support both "new" and "save as" operations. The file namer API can use this information to initialize a file namer interface (e.g., interface **2300** of FIG. **23**) based on the current file name and/or path. If, at block **2606**, the content item is not currently stored on online content management service **100**, the editing app can invoke the file namer API without providing current item-identifying information at block **2610**. In some instances, the editing app can provide a current file name at block **2610**.

At block **2612**, the user can interact with file namer interface **2300** to define the target path and filename. In some embodiments, file namer interface **2300** can be initialized based on information provided by the editing app at block **2608** or **2610**. For example, if current item-identifying information is provided at block **2608**, file namer interface **2300** can be initialized based on the path and/or file name. If only a file name is provided at block **2610**, file namer interface **2300** can be initialized with the user's home folder as the path and the file name populated by default.

Once the user has defined the target path and filename at block **2612**, the editing app can receive new item-identifying information from the file namer API at block **2614**. At block **2616**, the editing app can use the new item-identifying information to save the content item to online content management service **100**.

In some embodiments, a client app (e.g., client app **132**, **136** or **144** of FIG. **1**) can also implement a "save as" option, e.g., in connection with a content item previewer as shown in FIG. **4**. FIG. **27** shows a preview interface **2700** according to an embodiment of the present invention. In this example, a user "Flo," whose identity is indicated at **2702**, is viewing a content item **2704** that belongs to another user "Tim." That the item belongs to Tim can be indicated, e.g., in region **2706**.

Since the item belongs to Tim. Flo might or might not have rights to edit it. For example, some embodiments of online content management service **100** can allow a user to send a "share link" (e.g., a URL) to an item to another user. The receiving user can use the share link to view the item but generally is not permitted to modify it. As another example, some embodiments of online content management service **100** can allow one user to grant limited rights (e.g., view but not modify) to other users. In such instances, a user such as Flo may wish to save a copy of the item to her own account and edit it.

To facilitate such operations, interface **2700** can include a "edit a copy" button **2710**. If the user viewing interface **2700** selects button **2710**, a file namer interface similar or identical to interface **2300** of FIG. **23** can be presented. The interface can be initialized using the current name of the item. If the item is located in a folder where the user has rights to modify

or add items, that folder can be the default path; otherwise, the path can default to the user's home folder. In another embodiment, when a user selects button **2710**, the content item can be opened in an editing app (e.g., with an interface similar to those of FIG. **6**A, **6**B, or **25**), and the user can be prompted to provide a name and path for saving the item at a later point (e.g., when the user selects "save" or "save as" from within the editing app).

In some embodiments, edit-copy button **2710** can be presented every time the previewer is in use. In other embodiments, edit-copy button **2710** can be hidden or shown depending on assumptions about likely user behavior. For example, if a user is previewing a document in her own folder, it may be unlikely that she would want to start editing a copy (as opposed to editing the original), whereas if she is viewing a document using a share link, she may be more likely to want to save a copy to her own account. Accordingly, in some embodiments, interface **400** can be used for previewing content items to which the user has edit rights while interface **2700** can be used for previewing content items to which the user does not have edit rights.

Once the user has saved the content item to her own account, she can edit, modify, or otherwise operate on it, e.g., using any of the interfaces and workflows described above.

The various workflows and processes described herein can provide users with flexibility in interacting with content items stored on an online content management service. Users can create, edit, and/or save different versions of content items on a variety of platforms using workflows that have a similar feel to working with locally stored items. Further, workflows as described herein can be implemented on any or all of a user's devices (including devices that implement different operating platforms), allowing the user to seamlessly access and edit content items on different devices at different times. From the user's perspective, workflows like those described herein can help reduce extra effort associated with using an online content management service, allowing the user to more easily enjoy the benefits of such services (e.g., cross-platform access, reliable backup, etc.).

Any app that can read, create, modify, or otherwise make use of at least one type of content item can be used as an operating app. As described above, in some instances, the user can select an operating app from a client app using an app chooser interface that presents a list of apps from which the user selects. The app chooser in some embodiments can filter apps contextually, e.g., based on supported file type(s) and/or class(es) of operations. In some embodiments, operating app providers who want their apps included in the app chooser can register their apps with the online content service provider. At registration, the app provider can supply information about the app, such as name, icon, version information, supported file type(s), supported class(es) of operations, supported platform(s), and location(s) from which the user can obtain the app. The online content management service provider can store this app information in a data store that is accessible to the app chooser, and the app chooser can use the stored app information when selecting apps to include in the interface in a given context.

In some embodiments, online content management service **100** can implement security policies to limit access by operating apps. One example of a security policy includes requiring that operating apps be linked to the user's online account as a precondition for providing access. As described above, a linked app can be permitted to access the user's online content items; permitted access can include creating and/or deleting items as well as reading and/or modifying existing items. In some embodiments, the online content management service can restrict use of any or all of the workflows described herein to apps that have been linked to the user's account.

Linking of an unlinked operating app can be integrated into workflows, e.g., as described above with reference to FIG. **9**. In some embodiments, an app can disable options such as creating new online items or saving an item as an online item unless it is linked. In other embodiments, if the user selects an operation that would create or modify an online content item when the app is not linked, the app can first prompt the user to establish the link, then execute the selected operation.

In some embodiments, online content management service **100** can allow unlinked apps to have limited access to a user's online content items. For example, online content management service can associate content into "collections" based on user activity. (The collections as such might or might not be visible to the user.) If a user selects an unlinked operating app to operate on a particular content item, it can be inferred that the user wants to allow that app to access that item. Accordingly, the content item can be added to a collection of items accessible by the unlinked app. At any given time, an unlinked app can be granted access to items in its collection but not to other items. In some embodiments, an unlinked app can be restricted from certain activities, such as creating new content items, while being allowed to access existing items for which the user has indicated a desire to allow access.

In some instances, an operating app may require the user to create an account with a third-party service provider. For example, in the case of ordering apps, the order fulfillment service may need user information in order to deliver the order and/or collect payment. In some embodiments, when an operating app that requires a user account is invoked from a client app, the client app can provide user data to the operating app based on the information associated with the user's online content account (e.g., the user's name, email address, etc.). This can speed up account creation on the other service by reducing the need for the user to re-enter data.

While the invention has been described with respect to specific embodiments, one skilled in the art will recognize that numerous modifications are possible and that features described in connection with different embodiments can be combined. For example, while the description above may make reference to specific operations such as editing, printing, or ordering products, the functionality of an operating app can include any of these and/or other operations that may be performed using a content item. Any type of content item can be accessible to an operating app using workflows, processes, and interfaces similar to those described above.

An app chooser interface can represent available apps in a variety of formats (e.g., names and/or icons), and apps can be but need not be grouped as described above. Groups other than those described above can be used, and different groups might or might not be mutually exclusive, depending on how the groups are defined. Any group of apps can be sorted into a desired order based on various sort criteria such as name, recency of use, frequency of use, popularity or rating, an editorially-determined order, and so on. In some embodiments, the user may be able to change the sorting and/or grouping criteria.

In some embodiments described above, an app chooser can present recommended apps. Recommendations can be based on various criteria or combinations of criteria including but not limited to the examples described above. While recommending apps can be helpful to the user, it is not required. For instance, in some embodiments, the app chooser may offer a selection based on apps that are already installed on the client device and/or linked to the user's account. In some embodi-

ments, the app chooser may provide a referral to an online app source (or multiple such sources) without recommending specific apps.

Further, all of the interfaces described above and shown in the drawings are illustrative and can be modified as desired. The interfaces can be graphical user interfaces, with on-screen control elements that the user can operate, e.g., using a pointing device or touchscreen to select and activate the control elements. Other types of interfaces can also be used, including interfaces using soft keys, keystrokes, gestures, or the like. In addition, while visual interfaces are shown, it is to be understood that interfaces can also incorporate other sensory modalities, and an interface can have audio elements (e.g., voice command inputs and/or synthesized speech outputs), tactile and/or haptic elements, and so on, in addition to or instead of visual elements.

Embodiments described above may make reference to data structures and databases or data stores. It is to be understood that these terms can encompass any techniques and devices for organizing information into discrete records that can be stored, retrieved and interpreted by computer systems.

Embodiments of the present invention can be realized using any combination of dedicated components and/or programmable processors and/or other programmable devices. The various processes described herein can be implemented on the same processor or different processors in any combination. Where components are described as being configured to perform certain operations, such configuration can be accomplished, e.g., by designing electronic circuits to perform the operation, by programming programmable electronic circuits (such as microprocessors) to perform the operation, or any combination thereof. Further, while the embodiments described above may make reference to specific hardware and software components, those skilled in the art will appreciate that different combinations of hardware and/or software components may also be used and that particular operations described as being implemented in hardware might also be implemented in software or vice versa.

Computer programs incorporating various features of the present invention may be encoded and stored on various computer readable storage media; suitable media include magnetic disk or tape, optical storage media such as compact disk (CD) or DVD (digital versatile disk), flash memory, and other non-transitory media. Computer readable media encoded with the program code may be packaged with a compatible electronic device, or the program code may be provided separately from electronic devices (e.g., via Internet download or as a separately packaged computer-readable storage medium).

Thus, although the invention has been described with respect to specific embodiments, it will be appreciated that the invention is intended to cover all modifications and equivalents within the scope of the following claims.

What is claimed is:

1. A method comprising:

providing from a user device, by a client application configured to interface with an online content management service system and executing on the user device, authorization information to the online content management service system via a computer network to authorize the client application to access the online content management service system;

displaying on the user device, by the client application, an identifier of a first content item stored in a cloud storage on the online content management service system;

enabling, by the client application, a user to request edit control of the first content item;

detecting, by the client application, that the user has requested edit control of the first content item;

displaying on the user device, by the client application, in response to detecting that the user has requested edit control of the first content item, a selection interface operable to present a set of one or more selectable editing application identifiers to the user and to enable the user to select from the set a preferred editing application for editing locally the first content item, the set of one or more selectable editing application identifiers capable of including a particular editing application identifier to a particular editing application not installed on the user device;

receiving, via the selection interface, a user selection of the preferred editing application, the preferred editing application being different than the client application;

if the preferred editing application has not been installed on the user device:

enabling the user device to download the preferred editing application, and

enabling the user device to provide authorization information to the online content management service system;

if the preferred editing application has been installed, regardless of whether the preferred editing application has provided authorization information to the online content management service system, providing to the preferred editing application, by the client application, item-identifying information of the first content item, the item-identifying information being usable by the preferred editing application to obtain the first content item stored on the online content management service system;

if the preferred editing application has been installed, the authorization information has been provided to the online content management service system, and the authorization information has been verified by the online content management service system:

enabling the preferred editing application to save the first content item, as edited, in the cloud storage, and

upon user request, saving the first content item, as edited, by the preferred editing application in the cloud storage; and

if the preferred editing application has been installed, and the authorization information has not been provided to the online content management service system:

enabling the authorization information to be provided to the online content management service system for verification, and

until the authorization information is provided to and verified by the online content management service system, not enabling the preferred editing application to save the first content item, as edited, in the cloud storage, and upon user request, saving the first content item, as edited, by the preferred editing application in a local storage.

2. The method of claim **1** wherein the first content item has a first content type and the method further comprises identifying the set of one or more selectable editing applications usable to edit content items having the first content type.

3. The method of claim **1** further comprising directing the user device to execute the preferred editing application by, at least in part, the client application supplying a uniform resource locator (URL) that references a location of the preferred editing application to a URL handler on the user device.

4. The method of claim 3 wherein providing the item-identifying information includes appending an item identifier in a reference handler portion of the URL.

5. The method of claim 1 wherein the selection interface includes a set of one or more selectable icons corresponding to the set of one or more selectable editing application identifiers, the set of one or more selectable icons arranged into a plurality of groups,

the plurality of groups including a first group of selectable icons corresponding to applications that are installed on the user device and linked to the online content management service system,

the plurality of groups further including at least one of:

a second group of selectable icons corresponding to applications that are installed on the user device but not linked to the online content management service system; or

a third group of selectable icons corresponding to applications that are not installed on the user device and are recommended for use with the first content item.

6. The method of claim 5 further comprising, in the event that the preferred editing application corresponds to one of the icons in the third group:

installing the preferred editing application on the user device.

7. The method of claim 6 wherein installing the preferred editing application includes acquiring the preferred editing application from an online application source.

8. An electronic device comprising:

a data communication interface operable to communicate with an online content management service system;

a user interface including a display and a user input device; and

a processing unit coupled to the data communication interface and the user interface, the processing unit configured to:

provide by a client application configured to interface with the online content management service system, authorization information to the online content management service system via the data communication interface over a computer network to authorize the client application to access the online content management service system;

obtain, from the online content management service system via the data communication interface, information about a first content item stored in a cloud storage on the online content management service system;

display a first interface image by the client application, the first interface image for presenting an identifier of the first content item;

enable, by the client application, a user to request edit control of the first content item;

detect, by the client application, that the user has requested edit control of the first content item;

display, in response to detecting that the user has requested edit control, a second interface image by the client application, the second interface image for presenting a set of one or more selectable editing application identifiers to the user and enabling the user to select from the set a preferred editing application for editing locally the first content item, the set of one or more selectable editing application identifiers capable of including a particular editing application identifier to a particular editing application not installed on the user device;

receive, via the second interface, a user selection of the preferred editing application, the preferred editing application being different than the client application;

if the preferred editing application has not been installed on the user device:

enable the user device to download the preferred editing application, and

enable the user device to provide authorization information to the online content management service system;

if the preferred application has been installed, regardless of whether the preferred editing application has provided authorization information to the online content management service system, provide to the preferred editing application item-identifying information of the first content item, the item-identifying information being usable by the preferred editing application to obtain the first content item stored on the online content management service system via the data communication interface;

if the preferred editing application has been installed, the authorization information has been provided to the online content management service system, and the authorization information has been verified by the online content management service system:

enable the preferred editing application to save the first content item, as edited, in the cloud storage, and

upon user request, save the first content item, as edited, by the preferred editing application in the cloud storage; and

if the preferred editing application has been installed, and the authorization information has not been provided to or verified by the online content management service system:

enable the authorization information to be provided to the online content management service system for verification, and

until the authorization information is provided to and verified by the online content management service system, not enable the preferred editing application to save the first content item, as edited, in the cloud storage, and upon user request, save the first content item, as edited, by the preferred editing application in a local storage.

9. The electronic device of claim 8 wherein the processing unit is further configured to present a control operable by the user to access an online application source from which the preferred editing application is obtainable.

10. The electronic device of claim 8 wherein the processing unit is further configured to launch the preferred editing application by, at least in part, the client application supplying to an operating system a uniform resource locator (URL) that references a location of the preferred editing application to a URL handler on the electronic device.

11. The electronic device of claim 10 wherein the processing unit is further configured to append, by the client application, an item identifier in a reference handler portion of the URL.

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